METAL INDUSTRY

WITH WHICH ARE INCORPORATED

ALUMINUM WORLD — COPPER AND BRASS

BRASS FOUNDER and FINISHER

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Earning Profits in a Depression

ONE of the most interesting sections of the daily and trade press in these times is the column in the business news devoted to corporation reports. It is there that we see the quarterly, semi-annual and annual records of manufacturing companies, compared with similar periods of the preceding year. These comparisons are as clear a description of business conditions as if they were painted in vivid colors.

During the past three years, the list of companies showing losses instead of profits has of course, increased sharply. But there is one thing which catches the attention of the more than casual reader. There are still some organizations which continue to earn profits, some in small figures but others in considerable sums, right through these hard times. The question naturally occurs to that reader, "Why? Why can some companies swim against the tide?"

It is easy to guess at answers. It may be better management. It may be a local condition in which one industry is operating under fortunate circumstances. It may be a small concern which has had the good fortune to obtain a large order, thus covering itself for months to come.

But guessing being futile, THE METAL INDUSTRY addressed itself to those companies which, from their recent records, were still showing profits, asking them to tell us briefly just what plan or plans they had put into effect which enabled them to end such a hard year as 1932 with a profit. From those questioned we received answers, in almost all cases requesting that their names be kept confidential, but giving the information freely. It is this information which we give in brief below.

One large metal producing company stated that their earnings in 1932 from operations were far from large—short of dividend requirements—but because of some investments, reserves purposely set up in the past and some fortuitous windfalls, they were able to pay dividends without encroaching very much upon their surplus. Under the circumstances they could not suggest any plan which might be helpful to others in the industry.

Another large metal producing company explained that in their raw material departments they had shown considerable losses. It was only the profits made through manufactured products which pulled them out of the red and comfortably, although not luxuriously into the black side of the ledger. Even though this company offered no recommendations for others, their case is well worth considering. If they are representative, it can be inferred that it is wise to have a varied line of manufactured products in addition to a standard line of staples.

Another company, much smaller than the two named above, but with the interesting record of having earned over $250,000 in 1932, stated that they had been able to take up the slack resulting from decreased consumption by their older customers by developing new processes and new uses. This company is small enough so that all persons in executive positions are substantial stockholders. Consequently, it has been possible for them to have their management in able hands without the necessity of paying large salaries.

This case is also very interesting. It points to the efficiency of management by owners; also to the wisdom of keeping up research, developing new processes and discovering new uses.

One of our communications was addressed to the General Bronze Corporation. This company not only showed a profit of about $150,000 in 1932, but what is much more important, effected a reversal of its trend. The year 1931 had ended with a loss of almost $560,000. Clearly it is not the size of their earnings which is unusual, but rather the change from losses to profits in one of the worst years of American business history. How did they do it? Here are their own words, from Mr. John Polachek, president.

"Our ability to operate during the year 1932 at a profit was due partly to economies, more efficient production methods, and the co-operation of the loyal members of our organization. However, the main contributing cause was the accurate and classified daily cost system we have and which we use in our Estimating Department. We know when a job is being bought below cost—in which case we pass it up.

"The following will illustrate the above statement. Among the jobs figured by us so far this year, our price on seventy-one—

which we lost to others—was $973,453, whereas the jobs were bought for approximately $654,000. Of the five jobs we obtained so far this year, we received a preference over other bidders on four of them. We knew before we took these jobs that we would have no losses on them.

"For your information, I am enclosing herewith a copy of our Annual Report for the year 1932. The statement shows heavy losses during the years 1930 and 1931, due to a change in our management during that period. These were the only two years, since this establishment has been in existence, during which losses were created. Otherwise, I believe this concern has made by far more money during its existence than any other concern in our industry during the same period, and this because we use facts based on actual past performances in preparing our estimates, instead of the so-called 'good judgment,' 'wild guessing,' and unwarranted 'I'll take a chance' policies."

The above statements, although few, have a significance which far outweighs their number. In each case, the record was due to very definite factors, which were the results of previous planning. These factors were:

1. Setting up reserves.
2. Development of a varied line of manufactured products in addition to a standard line of raw materials.
3. Intensive management by owners; economies in operation.
4. Development of new processes.
5. The discovery of new uses for products.
6. The development and unswerving adherence to a cost system; refusing to take work below cost.

No extended eulogies of these methods are necessary. They speak clearly and loudly for themselves.

Machining Aluminum

By W. B. FRANCIS
Associate Editor

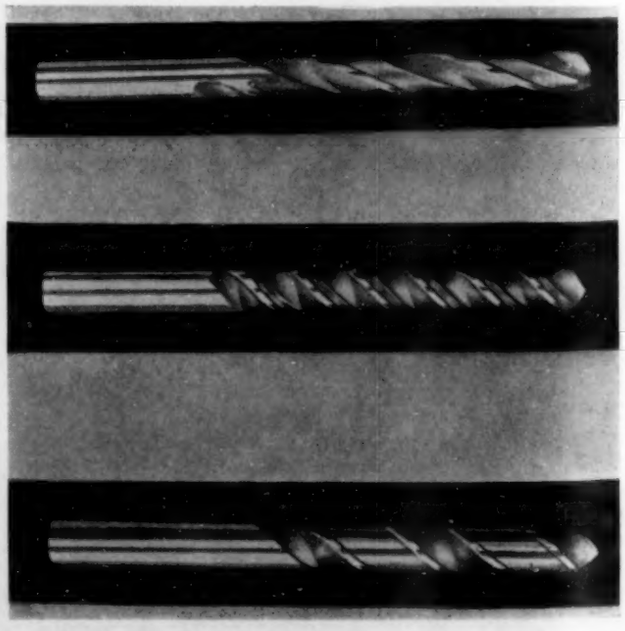
ALUMINUM and its alloys have become so widely adapted to so many uses that we could not now get along without these metals. In addition to the tremendous amount of research work needed to perfect this group of metals, there has also been a corresponding effort made to perfecting the most suitable tools for machining them. This has been made necessary by that too common habit of mechanics, trying to do new things and processes with the same tools that have been used for doing old or entirely different things. The efficient machining of aluminum and its alloys is rather a recent achievement.

It may be something of a paradox to say that the softer metal is the harder one to cut. Cutting soft white pine dulls a knife quickly. Aluminum has left a long trail of trouble in the attempts to machine it with the same tools used for machining steel and cast iron. Of course for only a small amount of work almost any cutting tool will serve, for time and cost do not figure much on such small jobs. But for commercial production contracts, the demand is for the surfacing of millions of square feet, and millions of holes must be drilled, reamed, tapped, and fitted.

Drilling

The general requirements for drilling aluminum are that high-speed twist drills be used; that these have a more blunt point than for drilling steel; that is, they should have a point with 140 degrees instead of 135 degrees for steel; that the cutting edges be made as keen and smooth as possible, which requires in some or many cases, hand or machine stoning or honing, so that there will be no irregularities, scratches or scores; and that the grooves, or flutes, be polished. Furthermore, the angle of the lands should be increased so that the twists of the helix will be about double that for steel, especially for deep holes. By the helix angle is meant that between the helix and the axis of the drill. The speeds should be higher and the feeds lower than for steel. Use a flood of soluble cutting oils, though the more expensive 50-50 kerosene-lard oil lubricant may be better for some work. Kerosene alone has been used.

Types of twist drills are illustrated in Figure 1. The one at A is the standard general purpose drill for steel. It has a point with 135 degrees, and a helix angle of 24 degrees. If the point be made more blunt, or 140 degrees this drill will serve better for short and medium depth holes in aluminum. However, the drill at B is the latest for the deeper holes in aluminum; its point is 140 degrees, the helix angle is 47 degrees, and the twists are shorter or twice the number on A, so that the cutting edges have more shear. Polished and stoned cutting edges are generally an advantage in producing clean smooth-surfaced deep holes at a rapid rate. The drill at C has a single flute with an angle of 40 degrees. It is similar to the drill formerly used for drilling hard wood, but it has been excelled for wood by the double-flute drill with the 140 degree angle. In fact hard wood and aluminum drill more like each other than like steel. For greatest efficiency, the high-speed steel drills should be used. The use of carbon-steel drills plated with chromium or tipped with carbides will be described later under the heading of Tipped Tools.



Twist Drills for Aluminum.

The Metal Manufacturing and Finishing Industries of the United States

By ADOLPH BREGMAN
Managing Editor

What It is; Who Buys Its Output; Who Provides It With Equipment and Supplies. A Survey of the Available Statistics of the American Industries Manufacturing Non-Ferrous Metal Products and Finishing All Metals; Also the Trades Which Consume These Products, and the Trades Furnishing Its Needs.—Part 3*

THE EXTENT OF THE METAL INDUSTRY. The total value of the products of all the ramifications of the non-ferrous metal industries, is huge. This figure would be of little value however as it must include a number of almost unrelated fields. For that reason we have broken down the industry into its component parts, giving the statistics of its production for the various units, as these units are the important divisions. For example, it is of no interest to a manufacturer of bronze doors that the total production of metal products runs over a billion dollars a year. It is of importance to him, however, to know that his particular field, let us say, bronze doors, window sash and frames, sold over $1,600,000 worth of products. He can thereby judge what share of the business he is getting, find out his place in the industry and know whether or not he is holding his own.

We list below the production of non-ferrous metal products of all sorts for the last census year (1929), as given by the Bureau of the Census:

NON-FERROUS METALS AND THEIR PRODUCTS

[This table presents statistics for all commodities covered by the Census of Manufactures classification, except those for which the figures must be withheld from publication in order to avoid disclosing, exactly or approximately, the data reported by individual establishments.]

Product	Number of establishments	Quantity	Value
Aluminum Manufactures			
Aggregate	(1)	.....	$161,994,398
Ware (principally cooking utensils and household articles)	55	.....	35,100,001
		Pounds	
Motor vehicle accessories and parts	24	15,333,432	7,466,752
Castings	392	82,979,337	38,267,674
Ingots produced for sale	(2)	120,721,143	26,299,723
Other aluminum manufactures, including rolled forms (bars, plates, and sheets)	35	.....	54,860,248
Clocks, Watches, and Parts*			
Aggregate	(1)	.....	$86,757,490
Clocks complete for use as timepieces only, total	39	.....	25,512,288
Clocks, except alarm and electric—			
With domestic movements—		Number	
1-day clocks, except automobile and chime	9	722,490	1,134,467
8-day clocks, except automobile and chime	13	1,186,875	5,012,880
Automobile	6	248,032	$1,184,730
Chime	8	66,285	1,025,965
With imported movements—			
Automobile	3	157,843	973,518
Other types	5	4,759	222,368
Alarm clocks, except electric	9	9,462,293	10,765,117
Electric clocks—			
Automobile	4	55,973	216,726
Other	21	.....	.....
Reported with number	..	386,500	4,659,156
Reported without number	..	.....	317,361
Clock movements:			
For use as timepieces only	8	668,636	729,935
For use in recording instruments, gages, time-stamps, switches, time locks, etc.	11	239,078	1,633,530
Instruments and devices complete, with clockwork mechanism:			
Time stamps, watchmen's clocks, time switches, time locks, etc.	18	129,310	1,790,382
Time-recording clocks	13	47,383	5,159,912
Clock materials and parts, including cases	24	.....	1,071,430
Watches, watchcases, watch movements, and parts, total	63	.....	50,860,013
Nonjeweled watches, men's and women's	5	9,479,979	9,672,554
Jeweled watches, complete—			
With domestic movements and cases, men's and women's	7	1,482,896	22,454,411
With cases produced and movements imported, men's and women's	9	40,930	1,318,436

* Parts 1 and 2 were published in our January and February issues.
[1] All footnotes will be given at the end of the final instalment of this series.—Ed.

Where Nickel is Used in Industry

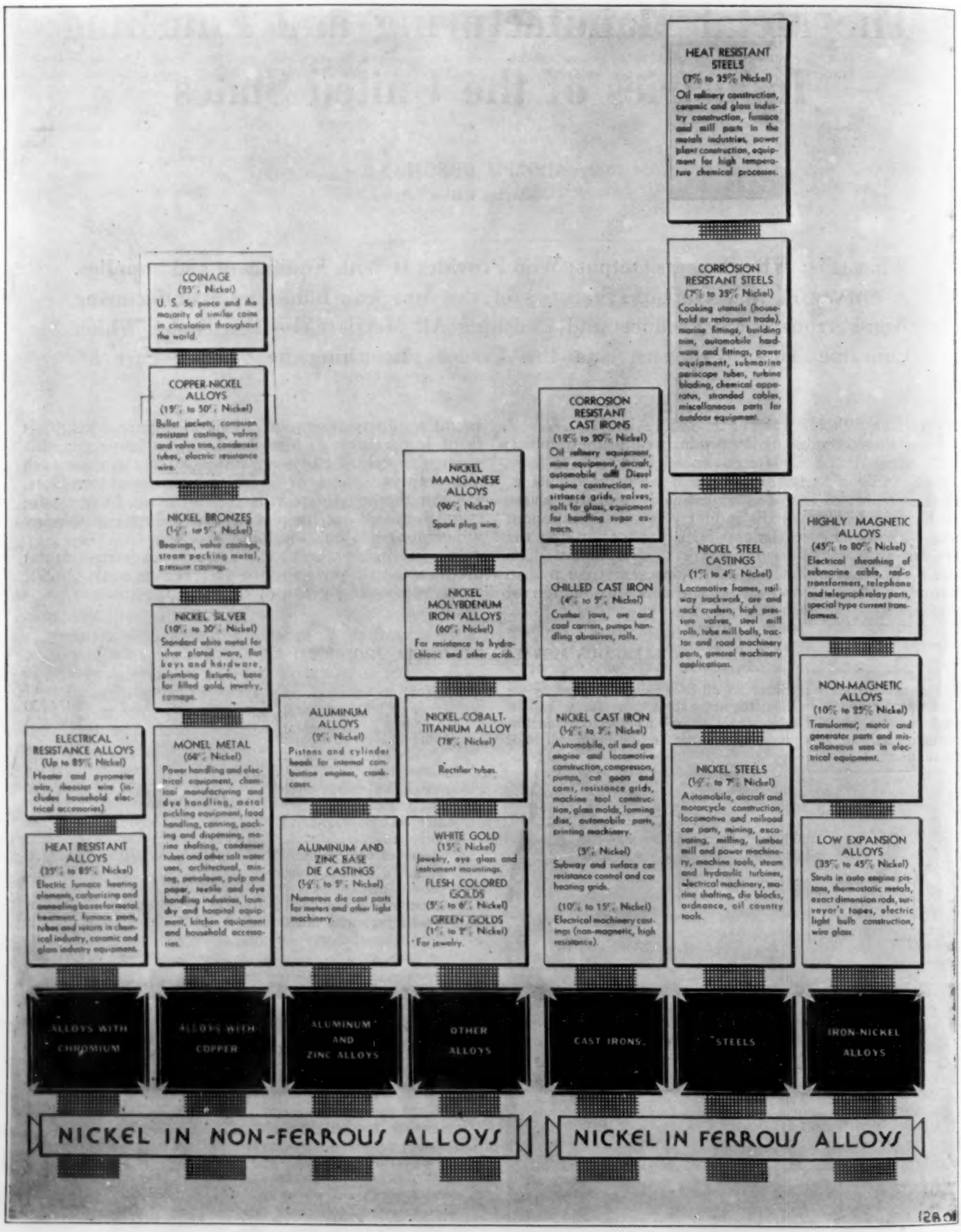

HEAT RESISTANT STEELS
(7% to 35% Nickel)
Oil refinery construction, ceramic and glass industry construction, furnace and mill parts in the metals industries, power plant construction, equipment for high temperature chemical processes.
CORROSION RESISTANT STEELS
(7% to 35% Nickel)
Cooking utensils (household or restaurant trade), marine fittings, building trim, automobile hardware and fittings, power equipment, submarine periscope tubes, turbine blading, chemical apparatus, stranded cables, miscellaneous parts for outdoor equipment.
COINAGE
(25% Nickel)
U. S. 5c piece and the majority of similar coins in circulation throughout the world.
COPPER-NICKEL ALLOYS
(15% to 30% Nickel)
Bullet jackets, corrosion resistant castings, valves and valve trim, condenser tubes, electric resistance wire.
NICKEL BRONZES
(1½% to 9% Nickel)
Bearings, valve castings, steam packing metal, pressure castings.
NICKEL SILVER
(10% to 30% Nickel)
Standard white metal for silver plated ware, flat keys and hardware, plumbing fixtures, base for filled gold, jewelry, coinage.
ELECTRICAL RESISTANCE ALLOYS
(Up to 85% Nickel)
Heater and pyrometer wire, rheostat wire (includes household electrical accessories).
MONEL METAL
(66% Nickel)
Power handling and electrical equipment, chemical manufacturing and dye handling, metal pickling equipment, food handling, canning, packing and dispensing, marine shafting, condenser tubes and other salt water uses, architectural, mining, petroleum, pulp and paper, textile and dye handling industries, laundry and hospital equipment, kitchen equipment and household accessories.
HEAT RESISTANT ALLOYS
(35% to 85% Nickel)
Electric furnace heating elements, carburizing and annealing boxes for metal treatment, furnace parts, tubes and valves in chemical industry, ceramic and glass industry equipment.
NICKEL MANGANESE ALLOYS
(96% Nickel)
Spark plug wire.
NICKEL MOLYBDENUM IRON ALLOYS
(60% Nickel)
For resistance to hydrochloric and other acids.
ALUMINUM ALLOYS
(2% Nickel)
Pistons and cylinder heads for internal combustion engines, crankcases.
NICKEL-COBALT-TITANIUM ALLOY
(78% Nickel)
Rectifier tubes.
ALUMINUM AND ZINC BASE DIE CASTINGS
(½% to 5% Nickel)
Numerous die cast parts for meters and other light machinery.
WHITE GOLD
(15% Nickel)
Jewelry, eye glass and instrument mountings.
FLESH COLORED GOLDS
(5% to 6% Nickel)
GREEN GOLDS
(1% to 2% Nickel)
For jewelry.
CORROSION RESISTANT CAST IRONS
(18% to 30% Nickel)
Oil refinery equipment, mine equipment, aircraft, automobile and Diesel engine construction, resistance grids, valves, rolls for glass, equipment for handling sugar extracts.
CHILLED CAST IRON
(4% to 9% Nickel)
Crusher jaws, ore and coal carriers, pumps handling abrasives, rolls.
NICKEL CAST IRON
(½% to 3% Nickel)
Automobile, oil and gas engine and locomotive construction, compressors, pumps, cut gears and cams, resistance grids, machine tool construction, glass molds, forming dies, automobile parts, printing machinery.
(5% Nickel)
Subway and surface car resistance control and car heating grids.
(10% to 15% Nickel)
Electrical machinery castings (non-magnetic, high resistance).
NICKEL STEEL CASTINGS
(1% to 4% Nickel)
Locomotive frames, railway trackwork, ore and rock crushers, high pressure valves, steel mill rolls, tube mill balls, tractor and road machinery parts, general machinery applications.
NICKEL STEELS
(½% to 7% Nickel)
Automobile, aircraft and motorcycle construction, locomotive and railroad car parts, mining, excavating, milling, lumber mill and power machinery, machine tools, steam and hydraulic turbines, electrical machinery, marine shafting, die blocks, ordnance, oil country tools.
HIGHLY MAGNETIC ALLOYS
(45% to 80% Nickel)
Electrical sheathing of submarine cable, radio transformers, telephone and telegraph relay parts, special type current transformers.
NON-MAGNETIC ALLOYS
(10% to 25% Nickel)
Transformer, motor and generator parts and miscellaneous uses in electrical equipment.
LOW EXPANSION ALLOYS
(35% to 45% Nickel)
Struts in auto engine pistons, thermostatic metals, exact dimension rods, surveyor's tapes, electric light bulb construction, wire glass.
ALLOYS WITH CHROMIUM
ALLOYS WITH COPPER
ALUMINUM AND ZINC ALLOYS
OTHER ALLOYS
CAST IRONS
STEELS
IRON-NICKEL ALLOYS
NICKEL IN NON-FERROUS ALLOYS
NICKEL IN FERROUS ALLOYS

Illustration by Courtesy of International Nickel Company of Canada.

	Estab.	Quantity	Value
Watchcases for sale separately—			
Solid platinum, gold, or silver—			
Men's	13	172,296	1,624,820
Women's	17	203,693	1,240,221
Gold filled—			
Men's	9	1,205,729	3,942,383
Women's	7	623,226	1,307,953
Other metals—			
Men's	10	1,075,335	899,213
Women's	9	476,331	445,348
Cases not reported by kind or quantity	11	.....	2,043,648
Jeweled movements, watch materials, and parts (produced for sale as such)[5]	25	.....	5,911,026

Collapsible Tubes

[This industry embraces establishments engaged primarily in the manufacture of collapsible tubes, made chiefly of tin, lead, and aluminum, for use as containers for tooth paste, shoe polish, shaving cream, etc.]

		Gross	
(Commodities not reported in detail)	17	3,447,938	$8,912,977

Copper, Tin, and Sheet-Iron Work, Including Galvanized-Iron Work, Not Elsewhere Classified

[Principal products: Cornices, gutters, spouts, etc., for the exterior of buildings; radiator shields, stove and furnace pipes, ventilators and skylights, tanks and bins, and culverts; and coppersmithing and sheet-iron work.]

(Commodities not reported in detail)	2,161	.....	$222,484,625

Electroplating

[The plating, by the electric process of various metal articles, such as automobile accessories, lighting fixtures, musical instruments, and jewelry, with gold, silver, nickel, or chromium.]

(Commodities not reported in detail)	534	.....	$23,727,916

Under the above classification are included only those shops which confine themselves strictly to job plating work and have no specialties—do no manufacturing—on their own account. As a matter of fact there are fully 1,500 shops in the United States which do job plating work, but about a thousand of them have special lines of their own which they carry on together with their contract business. In most cases they prefer to be listed as manufacturers rather than job platers, and for that reason they are scattered throughout a large number of metal and metal products manufacturers, thus obscuring the true size of the job plating industry.

There are in all, about 6,000 plating shops in the United States and Canada including strictly job platers, job platers who have lines which they themselves manufacture, and the balance, engaged primarily in the manufacture of metal products, having their own plating departments.

Fire Extinguishers, Chemical

[Principal products: Portable fire extinguishers, hose reels and other apparatus (except motor-propelled apparatus), and appliances for fire extinguishing through the use of chemicals; chemical preparations for use with such appliances; hand grenades for fire extinguishers, etc.]

(Commodities not reported in detail)	28	.....	*$8,566,089

Gold Leaf and Foil

		Number of packs	
Beating of gold into thin sheets for use in sign painting, decorating, bookbinding, etc., total	75	320,685	$3,872,481

Gold, Silver, and Platinum, Reducing and Refining, Not From the Ore

[Principal products: Gold, silver, and platinum refined and alloyed for jewelers' and silversmiths' use, made from old gold, silver, and platinum sweepings, clippings, and plated scrap, as well as from purchased bullion.]

(Commodities not reported in detail)	69	.....	$67,959,140

Jewelry

Aggregate	(1)	.....	$164,140,104
Jewelry, total	1,536	.....	142,433,383
Platinum	507	.....	41,372,454
Gold	582	.....	43,637,733
Gold-filled and rolled-gold-plate	129	.....	10,980,158
Gold-electroplated	79	.....	5,842,163
Silver	207	.....	10,609,618
Other metals	335	.....	29,991,257
Jewelry findings	130	.....	21,706,721

This article will be continued in an early issue.—Ed.

Platers' Meetings in Newark

The Newark Branch of the American Electroplaters' Society has held two open meetings during the past month. On Friday, April 7th, a special meeting was arranged in which the two features were a talk by **Dr. Mantell** of Pratt Institute, on the history and development of electroplating together with the growth of electrochemistry as a whole, and a description, by a representative of one of the large life insurance companies, of the advantages of group insurance.

Both before and after the meeting the members were entertained with special refreshments, frankfurters, sauerkraut, sandwiches and newly arrived 3.2.

On Saturday, April 29, the regular Annual Open Meeting was held at the Elks' Club. The educational session consisted of three talks. **O. B. J. Fraser** of the International Nickel Company described the process of manufacturing electrolytic nickel, from the ore to the finished product. The close relationship of this process to electroplating made it extremely interesting.

Dr. A. K. Graham of the University of Pennsylvania described his recent investigation into zinc anodes. A comparison of aluminum-mercury-zinc anodes with mercury-zinc anodes and pure zinc anodes showed that under the conditions obtaining in the experiments, the aluminum-mercury-zinc anode produced much less sludge than the other two. Cathode efficiencies were about the same for all three anodes, as were anode efficiencies. It was also shown that the anode polarization of the aluminum-mercury-zinc alloy was from 1/10 to 2/10 of a volt less than the other two anodes.

George B. Hogaboom of the Hanson Van Winkle-Munning Company, gave a comprehensive description of recent developments in electroplating covering improvements in nickel plating, plating on die castings, nickel on aluminum, black nickel, acid copper, the production of sheet copper by electrolysis, copper anodes, brass solutions, acid zinc, cyanide zinc, silver, tin, gold, platinum, palladium, rhodium, tungsten, chromium and various alloy plating.

The dance was held at 7:30 and was hugely enjoyed by the large number who attended. An excellent orchestra provided the music and adequate refreshments were at hand.

A most cheerful social event of the meeting was the appearance of George Gehling, of Philadelphia, who had been in the hospital for some weeks due to an automobile accident.

Melting Equipment in the Non-Ferrous Industry

R. H. STONE
Chemical Engineer*

A Broad Consideration of All Types of Equipment for Various Needs. Factors Are Flexibility, Adaptability, Quality of Metal, Working Conditions and Costs

I. INTRODUCTION

ANY one expecting to engage in non-ferrous melting or contemplating the modernization of a melting department is apt to obtain information on the subject only from sources which tend to favor the selection of one type or another of melting equipment.

It is not the purpose of this paper to give a complete study of the problem of the selection of the proper equipment; rather, it is the object to present all the factors necessary for a complete and accurate consideration, indicating the criteria to apply, letting the reader come to his own conclusions as to which types best suit his purposes.

The information offered in this paper has been obtained from such sources as the technical literature; books and papers prepared by outstanding authorities on foundry practice; statements of shop executives and operating men; cost surveys prepared by engineering organizations making a specialty of such work; melting cost summaries obtained by the authors themselves.

Types of Equipment Studied

The following classes of melting equipment are the best known types and are given, as far as known, in the order of their appearance or adoption commercially in foundry practice.

(1) Crucible furnaces—pit type using coke or coal fuel and, later, oil or gas.
(2) Crucible furnaces—tilting type using oil or gas fuel or coke.
(3) Open flame tilting or rocking types.
(4) Electric, indirect arc, rocking furnaces.
(5) Electric, vertical ring induction furnaces.
(6) Electric coreless induction furnace.
(7) Cupola.

Besides these listed types there are a few others but they are either so little used that it is hardly worth while to describe them or they have disappeared from the trade altogether. For example, in 1920 the following electric furnaces were listed as being in operation in non-ferrous foundries:

1. Ajax Wyatt
2. Bailey
3. Detroit
4. Booth
5. Northrup
6. Rennerfelt
7. Snyder
8. Van Schlegel
9. Repel Arc
10. Weeks
11. Ludlum
12. Greaves Etchells
13. General Electric

Of these only three are being manufactured today; the Ajax Wyatt, applicable to reasonably continuous operation; the Ajax Northrup, applicable principally to nickel bronzes; and the Detroit for general foundry use.

Considerations Governing Selection of Melting Equipment

Intelligent selection of melting equipment for a desired service requires consideration of the following points:

1. Diversity of Product. How many alloys must be melted and what quantities of each? The melting equipment must be suited to follow readily the day to day variations in the shop requirements for melted metal. In a shop melting several types of metals and alloys there should be no interference between the several schedules. This characteristic of the equipment is best described by the one word—**Flexibility.**

2. Adaptability or suitability of the equipment to meet varying conditions. Will the chosen method of melting be adapted to the weight of ingots or castings to be poured? Will it use the cheapest fuel or thermal energy available in the neighborhood and will the equipment chosen be capable of using any one of several fuels in case it is desirable or necessary to make a change? Also, will the chosen equipment readily melt the kinds of metal scrap returned from the machine shop such as bulky turnings?

3. Quality of Metal. It is also important that the equipment selected will produce the desired quality of metal as regards porosity, tensile strength, and correct analysis; thus high copper alloys may be contaminated by absorption of carbon monoxide gas, while high zinc alloys must be protected against over-heating and oxidation, which would result in excessive loss of zinc. A case in point is that of a shop melting a government specification bronze, calling for 40,000 lbs. tensile strength. It was found that this tensile strength could be reached consistently by melting in only one type of furnace.

4. Working conditions. Good working conditions undoubtedly tend to reduce labor turnover and some types of melting equipment will require a greater outlay for control and removal of fume than others.

5. Investment and operating costs. Other things being equal the selection of melting equipment will turn on the size of the investment required and the operating costs. That is, the cost of melting may be divided into (1) fixed charges dependent on the investment and such items as the demand charge if electricity is used, and (2) the expenses of operating—labor, fuel or thermal energy, metal shrinkage, refractories, repairs, etc. In the cost analyses, that are given later in this paper, only the direct

*Chairman, technical committee, Plumbago Crucible Association, in collaboration with the other members of the committee, K. E. Buck, H. P. Smith and H. E. White.

charges of melting are considered; the overhead is properly omitted. It is obvious that one shop may be efficient in melting and still be burdened with a large overhead over which the foundry superintendent could exercise no control while another shop might show high melting costs and low overhead. If overhead were included, the melting cost might be the same in these two shops, although the practice in the one might be efficient and in the other inefficient.

II. DESIGN AND OPERATION OF TYPES OF MELTING EQUIPMENT

The design and operation of non-ferrous melting furnaces will be discussed in the order of their listing in the Introduction. Before the war non-ferrous furnaces were mainly confined to the crucible types, 1 and 2, with a few

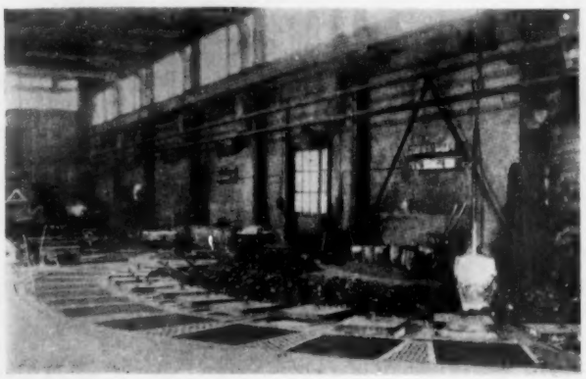


Fig. 1—Battery of Natural-Draft Pit-Type Crucible Furnaces. Coal Is Used for the Bed and Coke for Side Walls.

open flame type, 3. The war with its rush of production and disregard for costs fostered the use of electric types, (4) and (5). Later developments and improvements brought out the coreless induction type, (6). The cupola, type (7), is an adaptation from the ferrous foundry.

The following description of the various types is an attempt to give an insight into their operation with the advantages and disadvantages likely to be encountered.

(1) and (2)—Crucible Types

Crucible furnaces have been standard for so long that detailed description is hardly necessary.

Crucible furnaces may be classified as stationary or tilting types. Both of these types use all of the common fuels, coke, hard coal, oil, or gas, but generally only the stationary furnaces use coke or coal. Oil and gas are used interchangeably in all types.

The oldest type of melting equipment, consists usually of a shaft type furnace with grates and the crucible rests on a bed of fuel, either coal or coke, or both. These may be either of natural draft or forced draft type. In the stationary or pit type, the bed of fuel is prepared, the crucible charged and let down into the furnace. Fuel is then added and brought up around the sides of the crucible as the charge is melted. Metal is added until the crucible is full. It is then necessary to work the crucible tongs down around the crucible and lift it out. The fuel bed may then be prepared for the next charge. With this type of operation it is customary to obtain three or four heats per 9 hour day.

In the tilting-type, solid fuel operation, the practice is very much the same, except that the fuel is brought up higher and close to the top of the crucible, the whole furnace being tilted for pouring. It is possible to obtain a greater number of heats per day due to stored heat in the crucible and furnace. With the tilting crucible furnace using coke fuel and forced draft fuel consumption as low as 25 lbs. of coke per 100 lbs. of brass melted has been reported.[1] Difficulties in maintaining proper draft are, however, encountered.

In using coke or coal fuel particular care must be given to maintaining proper draft and proper selection of fuel so as not to create excessive clinkering, which results in damage to crucibles as well as other operating difficulties.

Oil and gas fired crucible furnaces, either stationary or tilting types, are much more simply and easily fired than the coke or coal furnaces. Oil fuel is cheaper than either gas or coke, but requires special storage and pumping equipment. There are any number of burners on the market for both gas and oil; as the efficiency of the furance depends considerably upon the burner, it is essential to pay particular attention to its selection. In the oil fired crucible furnace high oil pressure burners seem to give higher efficiency, while with gas fired furnaces gas and air mixing blowers give the best result.

Using the tilting type gas or oil fired crucible furnace of relatively large size (some are large enough to melt 1200 lbs. copper per heat) it is possible to obtain remarkably high efficiency.

In theory the sealed crucible is an ideal melting unit for producing high quality metal. The metal is not directly exposed to the action of the furnace gases and the likelihood of introducing impurities into the metal is

[1] H. W. Gillett, Brass Furnace Practice in the United States.

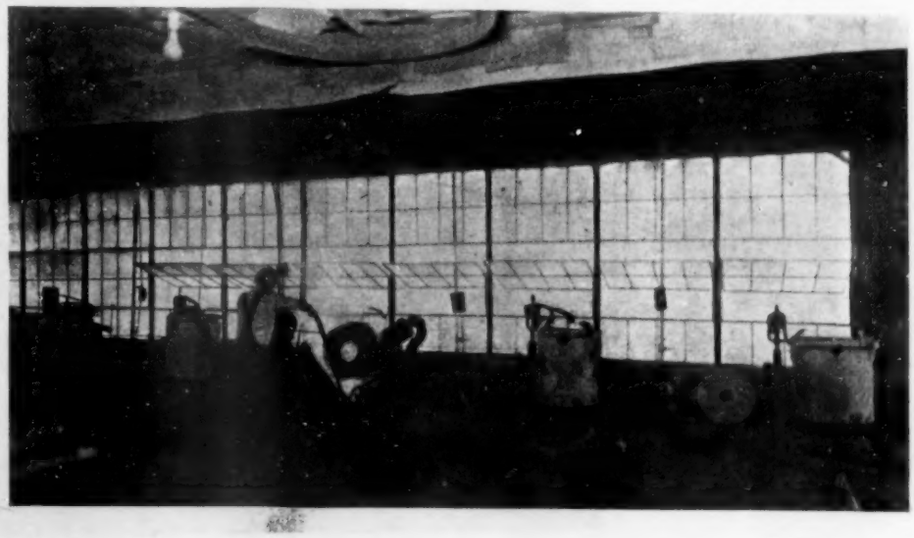


Fig. 2—A Battery of Tilting Type Furnaces.

therefore nil. Actually this ideal condition may be approached very closely, depending upon the type of equipment used and the technique of the operators.

Advantages and Disadvantages of Crucible Furnaces

Crucible furnaces have the advantage of permissible and wide flexibility. By simply changing crucibles any type or analysis of metal may be melted in successive charges without the likelihood of contamination.

They are adaptable to almost any type of fuel and conditions, do not carry high overhead charges and require a minimum of investment and depreciation charges when idle.

The inherent reliability of crucible furnaces is based not only on long use but on the improvements due to recent advances in scientific design of both furnaces and burners as well.

There is little question but that crucible melting can be relied upon consistently to yield better metal than any other type of equipment. Crucible melting is frequently used as a standard check method where trouble has been encountered with other types. An interesting illustration of this is given by E. Doughty in an article entitled "Oxidation—A Cause of Porosity in Leaded Bronzes."[2] After exhausting every expedient to eliminate porosity surrounding the core in a certain casting when poured with metal from four different types of non-crucible furnaces recourse was had to crucibles and the trouble eliminated at once.

Likewise in the work of the Ingot Metal Institute at the Bureau of Standards in Washington to eliminate variables so far as possible the melting is done in electric induction furnaces using a special double walled graphite crucible.[3]

Metal loss in modern types is so low that it is almost negligible.

Crucible furnaces require more floor space than the other types; however, in the interest of proper diversification this is not only desirable but necessary.

The old type of pit furnace, fired with coke, although very reliable and simple, is mussy and disagreeable to operate. This criticism, however, cannot be made of crucible melting as a whole since the introduction of improvements in design of furnaces and the use of oil and gas as fuel.

[2]Metals and Alloys, vol. 2, No. 4, Oct., 1931.
[3]Gardner and Saeger, "Factors Affecting the Physical Properties of Cast Red Brass," A. S. T. M., 1932, Preprint No. 50.

(3) Open Flame Furnaces

Here again we have the possibility of using either oil or gas. The solid fuels are not applicable, although, recently, powdered coal has been considered. There are several types of furnaces, cylindrical or "teapot" in shape, most of them operating on a rocking principle and applying the flame directly to the metal.

Usually in the operation of these furnaces the charge is put in, the flame turned on and when the charge begins to melt the furnace may or may not be rocked back and forth or through an entire revolution, depending upon the type of furnace and the desire of the operator.

Some furnaces pour from the side and are in the nature of twin units; others are single and another type has a flame entering from one end and exhausting from the other. Still another type is in the nature of a vertical barrel, the flame being projected down on the metal.

The furnace has a refractory lining and there is always a possibility of contamination from it and from previous melts absorbed by the lining as well as from the furnace gases. The lining must be dense enough to resist excessive penetration by metal and it must be mechanically and chemically resistant to both flame and slags. Naturally to satisfy and maintain these conditions will entail a considerable expense.

Advantages and Disadvantages of the Open Flame Furnace

The advantage of this type of melting unit is the small floor space required for high production at low melting cost disregarding metal loss and quality. For some types of alloys where losses are low in either actual amount or in money value and, where the nature of the work permits, these units can be used effectively.

The inherent disadvantages of the open flame furnace are high metal loss, possibility of contamination by absorption of the products of combustion and from the remains of previous charges. These units are not flexible in that it is not possible to melt successive charges of different composition without contamination.

(4) Indirect Arc Rocking Electric Type

The indirect arc furnace consists of a horizontal barrel with a door in the side and an electrode projected into each end. In fact, one of the first experimental furnaces of this type was made from an oil barrel lined with refractory material and rolled horizontally on a flat track

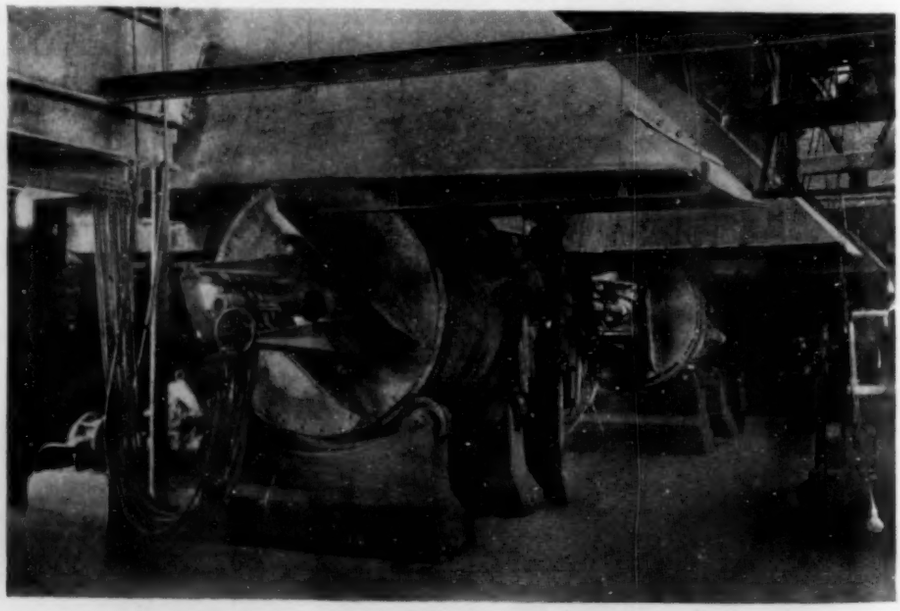


Fig. 3.—Over-Rocking Arc Type Electric Furnaces

to attain the rocking motion which is now done mechanically.

The inner lining of the furnace is frequently made of special refractory brick, back of which may be a layer of fire brick, with insulating brick next the shell, or the lining may be of two layers, leaving out the fire brick and making the other two layers correspondingly thicker. Handwheels are provided for electrode adjustment, and the rocking motion is automatically controlled by a reversing motor, contactors and suitable control device.

The furnace is kept stationary after a heat is started until some of the charge has begun to melt; it is then rocked through a small angle or "safe rock." If it is rocked too far the solid part of the charge will fall on the electrodes and may break them. The larger furnaces require much more care in this respect than the smaller types, as the latter may be rocked through a larger angle early in the heat, especially if the material melted is borings or other fine scrap not heavy enough to break the electrodes. The angle of rocking may be gradually increased as the charge melts until, by the time it is all melted, only the charging door and pouring spout are unwashed by the metal. The furnace is set slightly inclined so that the rocking imparts both an end-to-end and a rotary motion to the metal which gives a more complete stirring.

Advantages and Disadvantages of Indirect Arc Furnaces

This furnace is applicable to the melting of all types of non-ferrous and some ferrous alloys.

Its outstanding advantage is speed of melting of identical charges and ease of superheating when necessary.

With high zinc mixtures, due to the localized heating of the arc, metal losses are high. The zinc fumes given off make working conditions objectionable. Some plants, using a number of these furnaces, have found it necessary to put in extensive hood ventilating systems to improve this condition and add to the comfort of the workmen[4].

As the furnace operates with a carbon monoxide atmosphere of over 30% some difficulty is experienced with high copper alloys which absorb this gas. This may be counteracted by blowing air into the furnace but in this case electrode consumption is increased.

Some difficulty is experienced in determining the temperature of the metal in the furnace which is closed as tightly as possible to reduce metal loss.

High investment charges due to transformers and accessory equipment and the need for experienced operators precludes the use of the type of furnace to any but continous operation. Furthermore, it is not flexible due to the impossibility of changing alloys on account of contamination from the previous charge.

The maintenance cost of this furnace is high; the area of refractory just above the door is subject to a severe spalling action when the door is opened and refractory failure occurs here early. Expensive electrical equipment requires expert attention.

Energy demand charges are high and the furnace must be operated continuously to offset this. This is a very important point to bear in mind in connection with any electrically heated furnace. If the plant is idle or on reduced operations a considerable portion of the electric power charge continues and is known as a "demand" charge. With reduced consumption the rate per K.W. Hr. rapidly increases.

This article will be continued in an early issue.—Ed.

Melting Silver Chloride

Q.—We have on hand a large amount of silver chloride. saved from our stripping bath, which contains more or less sulphuric and nitric acids. We wish to melt this chloride and wish to know whether it is necessary to wash out the acid completely before melting.

We would also appreciate your comments as to melting this chloride so that we may get as close to fine silver as possible, as we plan to roll this metal into anodes.

A.—You are advised to wash the silver chloride before melting it, partly with the idea of getting a purer product and partly because otherwise the process of melting will be unnecessarily evil-smelling. There are several ways to convert it into silver, but most jewelers do not try to do this, as it is hard to get silver pure enough to use in new alloys.

They generally sell it as silver chloride.

Here is one way to recover silver. Wash the chloride carefully, with hot water, breaking up the lumps and rinsing until all stains are gone and the powder looks perfectly clean. Let it dry. It turns dark if exposed to light, but this does no harm. Now mix up equal parts of dry borax and soda ash (or use a prepared flux) and mix the dried chloride with an equal weight of the flux. Mix well.

Put into a large graphite crucible, filling it about one-third full. Melt in a gas furnace, slowly. Fumes come off, and sometimes it boils over, so watch it. As it melts down, add more chloride with flux. Let it heat for some time, until everything gets quiet. Finally let it cool in the crucible.

As to the fineness of the metal obtained, that will depend partly on your care in washing the chloride. Certain impurities, such as lead, are hard to remove. J. M.

Coating Metal with Rubber

Q.—Can you give me any information as to how metal either iron or bronze, is coated with rubber?

Some samples I have seen, appear to be first plated with a brass colored plate. Do you think this possible or was it done by an acid dip?

A.—The coating of steel with electrodeposited brass is essential to obtain adherence of rubber. The composition of the brass deposit must be close to 70% copper and 30% zinc. Plating solutions and anodes are used that will insure that copper-zinc ratio. Analytical control of the plating solution at stated periods is necessary. The deposits are also analyzed frequently so that uniform results can be maintained. The steel must be cleaned well before plating so as to have a good bond between the brass deposit and the steel. G. B. H.

Non-Ferrous Foundry Ingot Shapes

By PIERCE BARKER
Metallurgical Engineer, Detroit, Mich.

A Complete Description of the Characteristics Demanded of Ingots for Foundry Use. Practical Reasons for the Various Shapes Used. Visual Inspection Important

INGOTS or bars, (small ingots), to be suitable to the non-ferrous trade, must conform generally to the following fifteen conditions:

1—They must possess sales attractiveness.
2—Shape. This may be selected for a trade-mark, for advertising or for the users requirements.
3—Analysis and physical properties.
4—Freedom from surface defects, fins, etc.
5—Soundness. (Freedom from porosity etc.)
6—Appearance as to color (in the case of aluminum, brass or copper.)
7—Notches. Suitable for making fractions of total ingot weights.
8—Uniformity of shape, size, weight, quality and composition.
9—Condition of face (or surface condition). In the case of copper, it is "Pitch."
10—Size and weight suitable for melting requirements in the foundry.
11—Ease of pouring by the producer.
12—Ease of removal from the molds.
13—Compactness, (for storing and shipping.)
14—Rapid and economical handling.
15—Stacking and piling.

These conditions are given in what may be considered the order of their importance; but whether one should have preference over the others is immaterial as satisfactory ingots must in general conform to all fifteen requirements.

A brief description of each of these requirements, will prove of interest to the smelter in assisting him to produce better ingots.

Sales Attractiveness

The ingots must appeal to the eye as well as to the pocketbook, because in case of trouble in the foundry, the first cry of the caster is, "The metal's no good!" A poor looking ingot will unsell itself, even though its chemical and physical properties are otherwise satisfactory. Sometimes a new and unusual shape, modernistic in its lines, will help very much to sell an ingot. Again, the weight may appeal to a consumer's special requirements. More frequently, when the physical and chemical properties of the alloy produce uniformly satisfactory castings, particularly suiting the consumer's conditions, less attention is paid to the sales attractiveness; past performance sells the product, perhaps in conjunction with price per pound. In general, however, to get and hold attention, the sales attractiveness is of decided value in opening up new fields. One producer advertises "7 Point" metal.

Shape

This may be selected for trade-mark, advertising purposes or for a consumer's special requirements.

Most metal producers have special ingot shapes of their own, and these serve to advertise their product. In addition, the ingots may have special identifying marks or letters cast into them. All such marks or lettering should be cast into the ingot so that it may not be removed without destroying the contour of the shape because when cast onto shape as an addition or projection, they may be removed and the ingot passed as non-identified or nameless.

A shape may be made to the consumer's specifications, to suit some special melting or casting conditions. For example, a casting foundry may desire a triangular or rectangular cross-section for a bar having a definite weight, so that small uniform additions may be made to the melting pot to replace exactly that removed for casting purposes, thus maintaining the casting temperature of the metal. A shape must also be such that it can be fed into a crucible or through a small opening in a crucible furnace. It must also be readily handled, sheared or cut.

Analysis and Physical Properties

The metal must conform to the specification limits as set by the purchaser, or designated in the Standard Specifications of the A. S. T. M., S. A. E., U. S. Government, or other recognized organizations. These specifications include, in addition to the chemical analysis, certain physical properties. The metal must be clean and free from dirt, dross, oxides and other impurities. In the case of bearing metals particularly, oxides alone will condemn their application, even though the chemical characteristics are satisfactory, and this generally holds true for the other alloys, particularly aluminum. The metal must not be burned or overheated previous to pouring. A fractured ingot which shows the right grain structure and color, for that particular metal or alloy indicates good, clean, satisfactory material.

Metal which has been overheated is full of oxides, and the only way to restore its usefulness is to recast it into ingot form several times to sweat out the oxide inclusions. If metal is overheated previous to casting, many melters attempt to bring it to the proper pouring temperature by adding ingots. This practice lowers the metal to the proper pouring temperature but it still contains the oxide inclusions which produce faulty castings.

Freedom from Surface Defects, Fins, Etc.

Freedom from surface defects and fins really comes under Sales Attractiveness, were it not for the fact that

fins also prevent safe handling and stacking, as well as spoiling the appearance of the ingot. In addition, they present a large surface with low weight, increase oxide contents thereby, and make weighing uncertain, as the fins may become broken off. Holes in the surface make an ingot unsightly and cause unfavorable comments which are decidedly detrimental to the reputation of the metal, even though it may be physically and chemically of a grade to produce good castings. Holes may result from several causes such as overheated metal, dross inclusions, poor technique in pouring; they also appear frequently in finished ingots where the metal is known to be properly manipulated; and they have been traced to the type of iron used in the mold itself.

Poor appearance, holes, discolorations and "poor metal" are closely associated in the minds of foundry metal users, and should be avoided wherever possible. Besides, when casting troubles arise in the foundry, the metal is sure to be accused first, as the cause. As eye appeal is also a great help in selling metal ingots, freedom from defects is essential.

Soundness, Freedom from Porosity, Etc.

An ingot should be sound, if the metal is of good grade. Selling arguments sometimes include fractures and etching to reveal interior defects, holes, and inferior grades of metal. The value of etching tests has been disputed, but fractures showing oxides and gas holes are indications of poorly refined metal.

Appearance as to Color, in the Case of Aluminum, Brass, or Copper

Appearance of the ingot is a decided aid in the selling thereof; it counts more than any other single direct factor. There is a psychological effect on the foundryman viewing a bright, solid, clean looking ingot of the correct color, etc., and he will state, "That's good metal," immediately upon seeing it, regardless of analysis and other equally important and desirable physical properties necessary for the particular castings under consideration.

In order to obtain appearance in ingots (and hence in finished castings):

a—The proper pouring temperature is essential.

b—The alloy must be clean and free from detrimental oxides, foreign substances, or other metals, such as impurities, that are injurious to casting, machining, pressure, etc.

c—The molds must be the right temperature. Cold molds make poor-looking ingots.

d—The molds must be clean. Whenever possible, molds should be kept exclusively for each alloy cast. Molds used for red brass, after having yellow brass cast in them, will make poor, dark looking ingots. Manganese bronze cast previously in the same molds used for red or yellow brasses will also cause unsightly looking ingots. Hence each set of molds should be kept exclusively for each particular alloy cast.

Sometimes it is advisable to coat the molds. For brasses, where the molds are made of gray iron, a soot coating will give good looking ingots, both for brasses and aluminum. For molds made of copper, in which copper is being cast, bone ash has been found to be an excellent coating. Soot is also used. These coatings help to prevent sticking of the ingot in the mold, which is disastrous to rapid and efficient pouring, particularly when a casting machine is used.

Rapid quenching immediately after setting is a decided asset in producing effective looking ingots. This applies to red brasses, copper, and particularly to plastic bronzes. It is not advisable to quench aluminum bronzes as this results in numerous surface cracks. High lead alloys make a dull colored ingot due to lead sweating on the surface. Aluminum ingots may be partially quenched by pouring a small amount of water on the ingot face.

The temperature of the molds is an important aid to good looking ingots, and sufficient molds must be provided in proportion to the size of the heats cast. Molds too hot or too cold are a detrimental factor.

Color is likewise affected by the impurities present in the alloy. To mention only a few: excess iron causes a brown coloration on the rough tops of brass ingots; likewise, aluminum causes a slight silvery film appearance on the sides. Phosphorus causes a ridge of parallel hairlines on the sides near the top. Sulphur causes a puffy appearance of the face or top. Manganese causes a bright streak across the face of a rough top brass ingot. The purity and pitch of copper affect the wrinkles of the face. In aluminum, high iron causes a spongy appearance of the ingot face.

Notches Suitable for Making Fractions of Total Ingot Weights

Notches should be so placed with relation to the cross-section, that they will furnish weak spots for facilitating the breaking of the ingots, particularly in aluminum. Thus they furnish a ready means of obtaining suitable fractions of total ingot weights for making accurate weights. Many notches are provided in an ingot or bar, where only small amounts of the metal are used for deoxidizing or other purposes. Some consumers may desire an ingot or bar with notches so placed that a definite weight of the total ingot-weight is obtained between the notches. Some manufacturers specify that the divisions (notches) between sectional pigs, shall have a cross section not to exceed 35% of the total cross-section of the pig, and that the weight of sectional pigs shall not exceed a specified number of pounds.

Notches are not always desirable. In pouring red brasses and bearing bronzes like 80-10-10, much better looking ingots are obtained if the notch is omitted, and a small straight ingot is used. The bridge in the mold (which makes the notch in the ingot) acts as a trap to enclose air stirred into the metal at pouring, and frequently porosity results from the entrapped air, at the bridge or notch.

Notches in an ingot provide a large ratio of surface to weight, which facilitates cooling, particularly with aluminum which has such a high specific heat and latent heat of fusion. When melting the ingots for castings, notches assist the melting by providing quicker heat penetration. Notches provide a means for readily breaking the ingots or bars into fractional parts for making weights.

This article will be continued in an early issue.—Ed.

Plated vs. Solid Metals

Q.—We are anxious to obtain information on the comparative rust resisting efficiency of mild steel, chromium plated, as compared with bronze or Everdur metal.

The product which we are getting ready to make is used in line construction and will be subjected to all the elements.

If the mild steel is copper struck, nickel plated and then chromium plated, what, in your opinion, would be its rust resisting efficiency compared with the bronze or Everdur metals?

A.—There is no comparison between the permanence in service which bronze Everdur or copper will give as compared to steel, plain or plated. If hot galvanized construction cannot be used, I would suggest that you consider one of the copper alloys.—A. K. G.

A Cost Analysis of Zinc Die Castings vs. Machined Castings

By L. H. MORIN

Formerly Chief Engineer, Doehler Die Casting Company;
Now with Pack-Morin, Inc., Consulting Engineers, New York

FROM A PAPER READ AT THE BUFFALO SECTION MEETING, A. S. M. E., BUFFALO, N. Y., OCTOBER 3, 1932

THE following examples show an actual comparative cost analysis between zinc die castings and machined castings. The cost figures for the machined castings were submitted by a reputable machine shop, and the die-casting costs are by the author, taken from an actual example. Fig. 1 illustrates the drive segment estimated, and Fig. 2 the operating cam estimated.

The cost analysis of the drive segment for 1,000 machined castings, including patterns and tools, is as follows:

	RATE	PER PIECE
Pattern	$10.00	$0.01
Material (weight of casting 1 lb.)	0.07 lb.	0.07
A—Operation: Potter & Johnson machine, finish face and bore hole, 4 min.	1.30 hr.	0.045
B—Operation: Grind hub, 1 min.	3.00 hr.	0.025
C—Operation: Drilling large holes, 4 min.	1.30 hr.	0.045
Drilling Fixtures	25.00	0.025
D—Operation: Mill radius, 3 min.	1.50 hr.	0.04
Milling Fixtures	20.00	0.02
E—Operation: Cutting teeth, 6 min.	1.30 hr.	0.065
Mandrel for cutting teeth	25.00	0.025
F—Operation: Splitting, 2 min.	1.50 hr.	0.025
G—Operation: Drilling small holes, 3 min.	1.30 hr.	0.07
H—Operation: Make and assemble pin, 1 min.	1.30 hr.	0.02
J—Operation: Bushing, 1 min.	1.30 hr.	0.02
Total cost for one drive segment machined casting		$0.505

(The cost of bushing is eliminated because this part is used in both analyses.)

The cost analysis of the operating cam (see Fig. 2) for 1,000 machined castings, including patterns and tools, is as follows:

	RATE	PER PIECE
Pattern	$10.00	$0.01
Material	0.07	0.245
A—Operation: Potter & Johnson machine, chucked by 2¾ diam., face 4⅛, drill center hole and turn 4⅛ diam. (Man runs two machines, 6 min.)	1.30 hr.	0.065
B—Operation: Potter & Johnson machine, chucked by 4⅛ diam., face and turn 2¾ diam., 6 min.	1.30 hr.	0.065
C—Operation: Broaching ½ sq. hole, finish 2 in 1 setting, 2 min.	1.50 hr.	0.025
Broach	50.00	0.05
D—Operation: Mill 2 drops in cam face, 6 min.	1.50 hr.	0.15
Cutter for cam face	20.00	0.02
Arbor for milling cam face	15.00	0.015
E—Operation: Mill outside cam, 6 min.	1.30 hr.	0.13
Master cam	20.00	0.02
Arbor for Rowbottom machine	20.00	0.02
F—Operation: Milling 2¾ cam face, 6 min.	1.30 hr.	0.13
Master cam	20.00	0.02
G—Operation: Finish enclosed cam rough and finish cam race, 12 min.	1.30 hr.	0.26
Master cam	20.00	0.02
H—Operation: Drill, tap, bore, and counter-sink, 6 min.	1.30 hr.	0.13
Drilling jig	20.00	0.02
Total cost for one operating cam machined casting		$1.395

As a zinc die casting, both the drive segment and the operating cam were made in the same die.

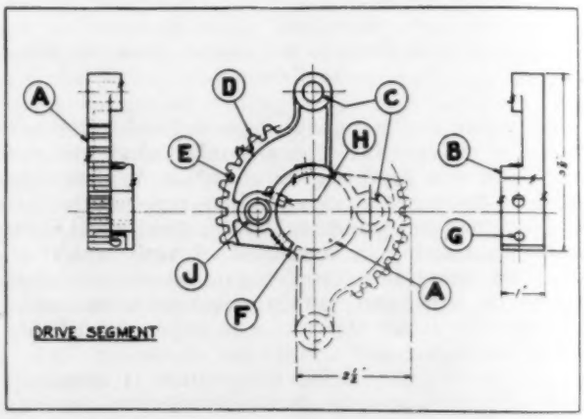


Figure 1. Drive Segment

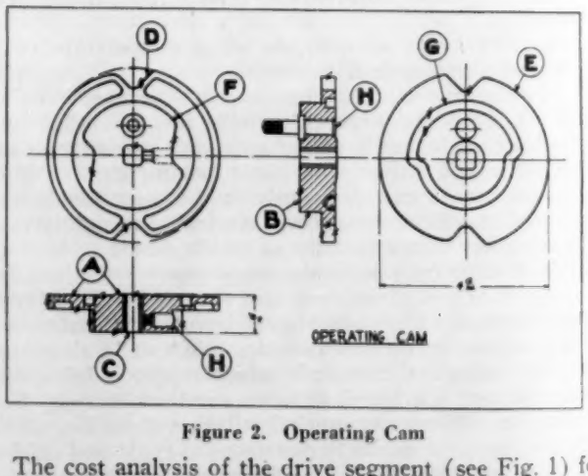


Figure 2. Operating Cam

The cost analysis of the drive segment (see Fig. 1) for 1,000 die castings, including die and tools, is as follows:

ITEM	PER PIECE
Die and tools ($220.00)	$0.22
Cost of casting	0.12
Total cost for one drive segment die casting	$0.34

The cost analysis of the operating cam (see Fig. 2) for 1,000 die castings, including die and tools, is as follows:

ITEM	PER PIECE
Die cost ($360.00)	$0.36
Cost of casting	0.19
Total cost for one operating cam die casting	$0.55

The comparison per casting is as follows:

	MACHINED CASTING	ZINC DIE CASTING	SAVING
Drive segment	$0.505	$0.34	$0.165
Operating cam	1.395	0.55	0.845

On a re-order the comparison per casting is as follows:

	MACHINED CASTING	ZINC DIE CASTING	SAVING
Drive segment	$0.425	$0.12	$0.305
Operating cam	1.165	0.19	0.975

These two examples indicate that a saving of more than one-half has resulted by die-casting in comparison with the machined casting for the operating cam, and approximately one-third for the drive segment.

On a re-order the price of the die-casting is approximately one-sixth of the cost of the machined casting for the operating cam, and approximately one-fourth for the drive segment.

Electroplating Zinc on Aluminum

By HAROLD K. WORK
Aluminum Company of America, Buffalo, N. Y.

Electroplates of Zinc Electrochemically Protect Aluminum from Corrosion—Zinc Electroplates Have Also Been of Value Where Properties of the Zinc Other Than Corrosion Resistance Are Desired

FROM THE REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY

As a result of the recent investigations of Dr. Cocks in England the plating of zinc on aluminum has received considerable attention. The work which has already been done by others will be reviewed briefly in this paper, and the results of some work carried out in the Aluminum Research Laboratories will be reported.

Earlier Investigations

At various times publications on the zinc plating of aluminum have appeared. It was not until recently, however, that it was recognized that zinc, in spite of its relative position in the electromotive series, would electrochemically protect aluminum. Seligman and Williams[1] pointed this out in 1920, but concluded at that time that such protection was not practical.

Sutton and Sidery[2] investigated the question in a broad study of the protection of aluminum against corrosion. They found that electrodeposited coatings of zinc, 0.0005" thick, afforded better protection to aluminum than did coatings of cadmium of similar thickness, but that the two types of deposit appeared to give an approximately equal degree of protection when applied to alloys of aluminum. They sand-blasted the aluminum surface prior to electroplating to secure adhesion of the electroplate. Cyanide baths of low free cyanide content and a sulfate bath containing betanaphthol as an addition agent, were found to be satisfactory. The corrosion tests which they used consisted of sea-water "wet and dry" tests and sea-water spray tests. On the better samples good protection was noted at twelve months, but at twenty months pitting was observed.

Shortly after the above publication the author[3] stated briefly that aluminum could be electroplated on from a cyanide solution and that other metals could then be electroplated over the zinc. Except where zinc alone was the coating metal, however, the corrosion resistance of the electroplate, unless heat-treated, was poor. Before plating, the aluminum surface was not given any special preparation to roughen the surface, but was merely cleaned by a brief immersion in a hot, mildly alkaline solution and dipped for 60 seconds in 5% hydrofluoric acid.

After experimenting in a general way with electroplating directly on an unroughened aluminum surface from numerous cyanide solutions, certain generalizations were derived concerning the best type of solution to use. Such a solution should be characterized by (1) a metal high in the electromotive series, (2) a minimum tendency to attack aluminum, (3) an addition agent, (4) a minimum gas evolution at cathode.

A solution answering these requirements is the following:

	G./L.	OZ./GAL.
Zinc cyanide, $Zn(CN)_2$	30	4
Sodium cyanide, NaCN	30	4
Ammonium hydroxide, NH_4OH (Sp. G. 0.90)	30	4
Peptone or	1	0.12
Gelatin	5	0.67

Solution used at room temperature

Of various solutions tested, those having zinc (a metal high in the electromotive series) consistently gave the best results. Other solutions tended to give blistered deposits. Even in plating with zinc it was necessary to modify the usual type of highly alkaline solution. Such solutions attacked the aluminum and only by exercising special care could the electroplates be applied directly. Substitution of ammonium hydroxide for sodium hydroxide reduced this difficulty, but did not completely eliminate it. An addition agent was needed for best results. Of various addi-

[1] J. Inst. Metals 23, 172 (1920).
[2] J. Inst. Metals 38 (No. 2), 241 (1927).
[3] Trans. Am. Electrochem. Soc. 53, 361 (1928).

tion agents tested, peptone, gelatin, and gum arabic were most satisfactory. Peptone was most effective, but when a bath was used intermittently, gelatin gave more constant results. For continuous plant use peptone has given better service. In using this solution the free cyanide content should be maintained as low as possible, although a small amount is advisable to prevent coating of the anode.

In order to avoid blistering it is better to operate at low current densities, 0.5 amp./sq.dm. (5 amp./sq.ft.) or less. Plates applied from the above solution adhere well to the aluminum. As a preparation for such plating the aluminum merely has to be cleaned in a mildly alkaline cleaner of 7.5 g./l. (1 oz./gal.) each of sodium carbonate and trisodium phosphate and given a one-minute dip in 5% hydrofluoric acid. This does not specially roughen the surface. Due to the low current density used in the plating, this particular cyanide solution finds its greatest application in the formation of a thin preliminary coat before other more rapid plating solutions are applied. A variety of electroplates have been applied over this thin zinc electroplate and very adherent deposits have been obtained. Unfortunately, however, with the exception of zinc and special heat-treated combinations, these secondary coatings are not particularly resistant to corrosion. The softer metals, such as copper, usually blister on exposure to moisture or in the salt spray test, while harder metals, such as nickel, usually peel. On the other hand, where zinc alone is the coating metal this type of corrosion does not take place. In fact, the aluminum is actually protected by the zinc.

The method of zinc plating used for the corrosion experiments reported later, consisted in applying a five-minute electroplate of cyanide zinc from the above solution and then plating thirty minutes in the following acid bath[4] at 3 amp./sq.dm. (28 amp./sq.ft.) to give a deposit 0.025 m.m. (0.001 in.) thick:

	g./L.	OZ./GAL.
Zinc sulfate, $ZnSO_4.7H_2O$	360	48
Ammonium chloride, NH_4Cl	30	4
Sodium acetate, $NaC_2H_3O_2.3H_2O$	15	2
Glucose	120	16

While a cyanide bath could be used for the latter coating, this acid bath is somewhat easier to operate. Other acid baths will also give good deposits.

As has been indicated earlier, judging from the relative position of the metal in the electromotive series alone, it would not be expected that zinc would electrochemically protect aluminum from corrosion. That this is actually the case, at least under certain conditions, has already been indicated. Potential measurements of metal couples by Edwards and Taylor[5] have shown that in normal sodium chloride solutions zinc is electronegative (anodic) to aluminum. Such behavior of two metals is not uncommon, and is usually a result of passivity induced by a surface film on at least one of the metals.

Dornauf[6] compared cadmium and zinc electroplates for the protection of aluminum. His corrosion tests of 50 days, using 3% sodium chloride solution, favored cadmium.

H. C. Cocks[7] extended the work of Sutton and Sidery on zinc plating on aluminum. He made a broad study of plating solutions and as a result of this study preferred sulfate baths for deposition on aluminum alloys except in the case of irregularly shaped articles. Gum arabic was considered the best "addition agent" for the solution. He applied the zinc to a sand-blasted aluminum surface. His electroplates, which were one-half as thick as those reported on later in this paper, resisted a sea salt water spray (a few minutes three times a day) for about a year. He considered these results quite satisfactory.

Akimov[8] demonstrated that zinc protects duraluminum in Black Sea Water even to quite a distance from the area actually covered by zinc. He advances an electrochemical theory based on the formation of a surface film on the aluminum to explain this.

Corrosion Tests[9]

In order to determine quantitatively the corrosion resistance of zinc plated aluminum, samples were plated by the procedure outlined as that preferred by the author. That consisted of applying a thin plate from a cyanide bath to an unroughened surface and then finishing the plating in an acid bath.

The corrosion tests[10] used in this investigation, consisted in measuring the change in physical properties of the plated and unplated aluminum, resulting from exposure to a 20% salt spray. With 17 ST (Cu 4.0; Mn 0.5; Mg 0.5) corrosion was temporarily prevented by plating with zinc. At the end of four weeks in the 20% salt spray the zinc-plated specimens showed no loss in physical properties, while with the unplated metal a noticeable loss had occurred. At the end of twelve weeks this loss had increased and a small loss had also appeared for the zinc-plated metal. This would indicate that the zinc had protected the aluminum for fully four weeks, but dissolved after that period and lost its protecting property. Such protection is quite good and undoubtedly has value for certain applications. For general use, however, a duplex aluminum product developed by E. H. Dix, Jr., of the Aluminum Company of America, has greater value. This is known as "Alclad"[11] 17ST, and consists of an aluminum alloy core covered by a surface layer of pure aluminum, which is alloyed and integral with the core. Under similar conditions to those used for testing the corrosion of the zinc-plated 17ST, "Alclad" 17ST has maintained its physical properties for several years. When zinc-plated 2S (commercially pure aluminum) was tested similarly for corrosion resistance, the electroplated metal lost in physical properties more rapidly than the unplated metal until the zinc was dissolved. This no doubt indicates that the zinc in protecting the aluminum dissolves more rapidly than the aluminum itself and has little value in protecting 2S under the above conditions.

Applications

The commercialization of zinc plated aluminum in this country has been restricted to a few special uses. Zinc has been electroplated on the lower edge of several hundred thousand radio shield cans to secure a special type of contact between the can and its support. Manufacturers of rubber goods have zinc plated aluminum to meet requirements that aluminum alone would not satisfy. In a few instances, where "Alclad" metal could not be used, zinc electroplating has been substituted to advantage, to resist corrosion. Electroplates of zinc have been put on aluminum commercially to prevent the seizing of threaded parts.

Zinc-plated aluminum also has an interesting property that ought to be of value. It may be soldered by ordinary procedures, providing the electroplate is at least 0.008 m.m. (0.0003") thick and that the electroplating has been properly applied. If the coating is thinner the zinc apparently dissolves in the solder, and the ordinary procedures can not be used.

[4]Blum & Hogaboom, Electroplating & Electroforming, p. 324 (1930).
[5]Trans. Am. Electrochem. Soc. 56, 27 (1929).
[6]Korrosion u. Metallschutz 4, 97-102 (1928).
[7]Journ. Electroplaters' & Depositors' Tech. Soc. 5, 83 (1930).
[8]Z. Metallkunde 23, 249 (1931).
[9]Trans. Electrochem. Soc. 60, 117 (1930).
[10]Supplied by courtesy of Dr. L. J. Weber, Aluminum Co. of America.
[11]Dix., E. H., Nat. Advisory Comm. for Aeronautics, Technical Note 259, Aug., 1927.

Metals and Finishes in New Applications

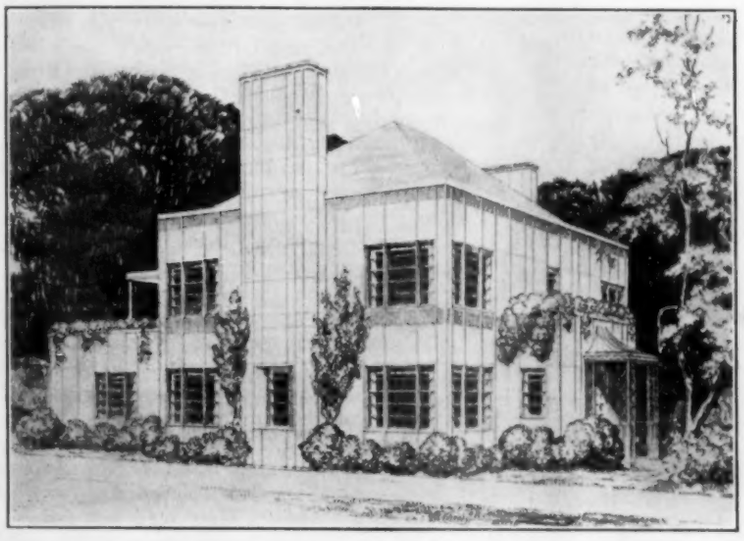
Porcelain Enameled Houses

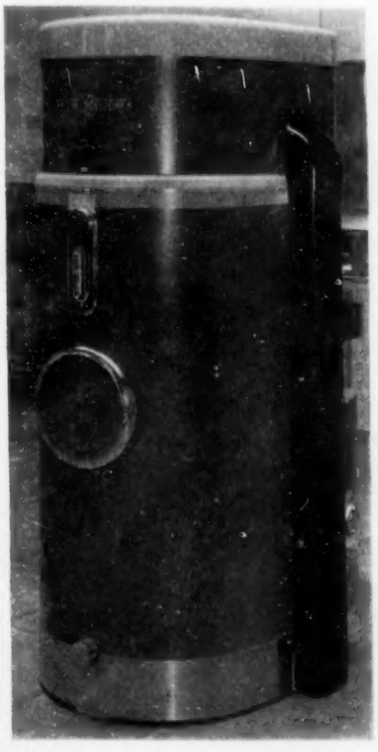
A PORCELAIN enameled metal house built to meet the requirements of a small family will be one of the features of the Home and Industrial Arts show at the exposition of A Century of Progress—Chicago's 1933 World's Fair which opens next month.

This house will be finished in bright, shimmering porcelain enamel, fused on sheet metal. It will never require painting. A bath with a garden hose will remove any grime that collects on its surface. The house will be fire-proof, vermin-proof, and insulated against heat and cold. It will be of modern design, to conform with the architectural scheme of the exposition, and is expected to be a popular attraction.

The Ferro Enamel Corporation, Cleveland, Ohio, is sponsoring the house at the Chicago fair, in collaboration with the American Rolling Mills Company, which fabricated the sheet steel used as a base for the porcelain enamel. The Ferro company says that buildings constructed of porcelain enameled metal sheets may be fabricated in the shop and assembled on the site. Such buildings can be so designed that they can be dismantled and moved to another site without incurring any expense other than the cost of dismantling and erection, and installation of plumbing, heating and wiring. Portability is an important factor for such applications as gasoline stations, with traffic lanes being constantly diverted and business sections rapidly changing. The permanently built automobile service station must often be written off as a total loss.

In restaurants and other commercial applications porcelain enameled sheets used for interior decoration have been enhanced in beauty by the use of chromium plated strips over the joints. Ease of cleaning, the variety of colors available, and elimination of repainting are among the advantages of porcelain enameled material for construction.





Above—Porcelain Enameled Metal House Recently Built at Cleveland by Ferro Enamel Corporation.

Right—The New General Electric Oil Furnace. It Is Finished in Lacquer Enamel and Chromium Plate.

Chromium and Lacquer Enamel on an Oil Furnace

MODERN manufacturing and merchandising practice requires that considerable attention be given to the appearance of any product which is expected to find a wide market. The new oil furnace which was placed on the market recently by the General Electric Company, Schenectady, N. Y., is an example of a product whose maker has paid proper attention not only to the scientific development of it for its purpose, but to appearance value as well. Chromium plated trim and colored lacquer enamel will doubtless do much to help sell this product.

EDITORIALS

Business and the Currency Problem

AFTER a generation, the United States is again faced with the question of the maintenance or revision of her currency standards. During the past month, by presidential edict, we have gone off the gold standard. The Senate has come very close to passing a bill remonetizing silver on the 16 to 1 basis, the standard which Bryan advocated in 1896. President Roosevelt has since asked for the passage of a bill giving him power to (1) order the issue of $3,000,000,000 in currency to redeeem outstanding Government bonds, this currency to be retired at 4 per cent a year; (2) decrease the amount of gold in American coin by any amount decided upon, not to exceed 50 per cent.

In many aspects the whole subject seems academic. It bristles with "theories," experts disagree and political party lines are broken. How then can the lay business man understand it? And yet he must. The economic life of all business (and for that matter labor) depends upon the wise management of a nation's currency.

We are now faced with a variety of demands in and out of Congress. We are urged (1) to return to the strict gold standard "for the safety of our currency"; (2) to remonetize silver—make it a legal reserve in unlimited quantities for paper money; (3) to issue freely and without restraint, paper money—greenbacks—without gold or silver backing.

What is the consensus of informed opinion about these proposals? Amid the welter of political controversy, biased self-interest, academic theorizing, hedging to avoid commitment and honest differences of viewpoint, there seems to be a fair amount of agreement on the following points.

It was wise to go off the gold standard at this time. A standard is valid only when all nations agree on it and abide by it. So few nations were left on the gold standard since Britain stepped off, that those who remained have been at a disadvantage in foreign markets.

The adoption of silver for currency may be an aid to world-wide recovery, providing all of the commercially important nations agree on it. It may be very worth our while to take payment in silver of a part of the debts owing us by other nations. The price, however, should be set at a reasonable figure, taking into consideration the present market for silver; certainly not the arbitrary 16 to 1 relation.

The bill to allow the issue of $3,000,000,000 in paper money and to debase our gold coin has possibilities for evil. The paper money idea sounds much worse than it really is on close inspection. It will not add to the public debt; it will only replace an equivalent amount of outstanding bonds. It will be retired at the rate of $120,000,000 per year—no more than the present interest on those bonds. There is justification for confidence that this is not strictly "wall paper" money.

The idea of the devaluation of our gold coinage is always alarming. It is true, of course, that it is not mandatory, only permissive; that it may help in establishing our currency in the correct relation to foreign currencies and in this way help to balance our out-of-kilter position in foreign trade. The Committee of the Nation (a voluntary group made up of some of our most prominent bankers and industrialists) recommended such a step, that is changing the number of grains of gold into which the currency would be converted, to a properly determined commodity price level and thereafter repeating this process of adjustment whenever necessary to keep prices from fluctuating too widely.

Nevertheless, there is sharp divergence of opinion on the safety of such "permission." Prominent industrialists appear on both sides of the question; statesmen have broken through party lines. Several past Secretaries of the Treasury disapprove of the bill.

It is also noteworthy that the demands from special interests in Congress are even less balanced than the proposed administration measure described above. To be sure we should all prefer to go along on the old-fashioned, safe and sane, old reliable gold standard. It seems, however, that the times, being out of joint, make this procedure impossible.

On one point all intelligent opinion is unanimous. It is inflexibly opposed to "fiat," "printing press," uncontrolled currency issues. That way lies ruin.

If it is at all possible to judge our present position in these times of overnight changes, a fair estimate seems to be:

(1) Our national credit has been strengthened by sharp cuts in our regular expenditures, leading to a provisionally balanced budget. The recent note issue by the Treasury for $500,000,000 to redeem part of our short term floating debt has been easily and quickly subscribed.

(2) The prices of most of our key raw materials have risen sharply. In the metal industries, tin, copper, zinc, lead and silver have advanced to the highest points in months.

(3) Actual business operations have advanced steadily for the five weeks ending April 22nd, bringing them back to about the position occupied just before the national bank closing. They are still very low, however—54.2 according to the Times Weekly Business Index, against 58 for the high point in December, and 58.5 for the week ending April 23, 1932.

(4) A great deal depends upon the results of the World Economic Conference to be held this summer in Europe, for which active preparations are being made by conferences with foreign representatives now going on in Washington.

The Thirty-Hour Week

A BILL has been passed by the United States Senate, sponsored by Senator Black, which prohibits for two years the interstate or foreign shipment of any article produced in the United States in a manufacturing establishment, workshop, mine, quarry, mill, cannery, etc., in which any employee works more than 6 hours in a day and 5 days in a week. The object of this bill is obviously to widen employment along the lines of the well known share-the-work-movement.

The bill, which has not yet been passed by the House, has elicited a storm of widely divergent comments. The steel industry seems to be strongly against it, the objections arising mainly from the impracticability of installing a measure of this kind in a continuous production industry. Another important objection is the factor of the variation in size of the plants to be regulated. It is a well known fact that the large bulk of our manufacturing plants employ only a comparatively small number of workers (estimated between 50 and 100 each). Installing a short shift and adding other workmen is a difficult problem in such plants, especially in many operations which require the close attention and skill of the man in charge. The American Engineering Council opposes the Black bill although it recognizes that our productivity has far outgrown the 48-hour week and even that in "normal" times, re-employment of all those formerly working in manufacturing operations cannot be effected without a wide re-adjustment.

The National Brass Association, an organization of manufacturers specializing in plumbing fixtures, takes the other stand. They are on record to the effect that ". . . . in order to create sufficient work for all, it seems to be imperative that working hours be shortened." Gerard Swope, president of the General Electric Company, has come out in favor of shortening the hours of work and setting minimum wage limits as well.

It seems to be the general attitude throughout industry that no one would oppose a bill which would alleviate unemployment or contribute to general business improvement, providing the regulations were of a practical nature. It seems to be difficult, however, to arrive at a solution which can be made compulsory and which will work well in all of our many different types and sizes of industrial operations.

Metals and the Brewing Industry

THE past three years of deflation have not broken us of the habit of inflating predictions.. One of the favorite targets for over-expanded statistics is the brewing industry. Professional wets have estimated that with the return of 3.2 per cent beer, 1,000,000 men would return to work, billions would be spent and hundreds of millions would accrue to the government in taxes. We would literally drink ourselves out of the depression! On the other hand, professional drys have predicted without qualification, the reduction of buying shoes and clothes to zero; the return of the saloon, where men will spend all their pay leaving nothing for food; that drunkenness would demoralize manufacturing efficiency. Immediate ruin is in prospect for industry and the home!

Leaving out opinions on the wet and dry issue, the merit of the excellent non-alcoholic beer, ale and stout, which have always been obtainable and other points of disagreement, the facts insofar as they affect industry seem to be as follows:

The brewing industry at its peak never employed over 75,000 men directly. Allowing for all possible increases in allied lines and supplies—bottles, barrels, boxes, glasses, chemicals, grains (even pretzels and pickles!), it is difficult to visualize the total re-employment of over 250,000 men. This is not to be sneezed at, of course, but it is not 1,000,000.

The money spent by the public on beer will of necessity be diverted from other industries. The general public has no surplus income from which to increase its expenditures. The more beer consumed, the less ginger-ale, soda and perhaps coffee and other commodities. On the whole, additional expenditure by the general public will be small.

Should there be a consumption of a billion dollars' worth of beer at retail prices, the income to the Federal Government will be about $125,000,000 per year. This should prove a lift in these times, but it will not by itself, allow for the reduction of taxes in other directions.

One factor which seems to hold greater possibilities is the capital expenditure necessary for equipment to enable breweries to take care of the demand (at the present time beyond their capacity), and also the expansion necessary in allied lines, such as cooperage works, refrigerating equipment, etc. All of these industries will take considerable tonnages of metals, such as copper, brass, bronze, tin and nickel. In addition a great deal of reconstruction work will have to be done in retail establishments for dispensing beer. It has been estimated that large sums may be required to recondition hotels, restaurants and bars, when definite methods of sale have been laid out. The total sums required for new equipment have also been subjected to inflated estimates, ranging between $500,000,000 and $1,000,000,000, but even the lower figure would be quite an item. This will be new investment in capital goods, of idle funds.

It is possible that the brewing industry will play a part in business improvement. By itself, however, it cannot be expected to play more than a moderate part. New equipment installations may turn out to be a start, but brewing must be joined by other industries before a complete recovery from the depression can be achieved.

The Electroplaters' Convention

FOR months we have published in our Associations and Societies columns, pre-convention reports of the preparations being made for the Annual Convention of the American Electroplaters' Society, to be held in Chicago, June 27-30. The Chicago Branch has been indefatigable in its efforts to make this convention—the first to be held in Chicago in a number of years—outstanding in the history of the Society.

The time and the place of the convention are fortunate. Chicago is the location of the Century of Progress Exposition. A number of technical societies will be meeting in that city during the coming summer. Those who attend the Platers' Convention will be able to see the Exposition with the minimum expenditure.

Plans have now been fairly definitely formulated for the program, which includes technical papers of the highest and most valuable type, covering such a wide variety of subjects as etching, nickel plating, cleaning, plating die castings, acids in the plating shop, automatic cadmium plating, and chromium plating.

The Platers' Convention includes entertainment, of course, but to the men attending, this is a minor feature. To them the Platers' Convention means business. It means the latest information on shop practice and new developments. It pays their firms to have them attend. It pays firms to require their men to attend, to pay their expenses and to receive written reports from them.

We repeat the slogan of the Chicago Branch, "You cannot afford to miss the 1933 American Electroplaters' Society Convention."

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

ASSOCIATE EDITORS

Metallurgical, Foundry, Rolling Mill, Mechanical

H. M. ST. JOHN — W. J. PETTIS
W. J. REARDON — W. B. FRANCIS

Electroplating, Polishing, and Metal Finishing

O. J. SIZELOVE — A. K. GRAHAM, Ph.D.
G. B. HOGABOOM — WALTER FRAINE

Black Nickel on Aluminum

Q.—Kindly give us complete directions in detail as to black nickeling aluminum. We would also appreciate information as to keeping the solution up.

Please inform us as to the correct voltage and amperage when one square foot of metal is placed in the solution; also, ten square feet of metal.

A.—The greatest factor to be considered in black nickel plating aluminum is the cleaning operation. A cleaner should be used that will not attack the metal and any of the cleaner manufacturers can supply you with this cleaner.

After the work is cleaned, rinse in clean cold water, dip the work in an acid pickle made of muriatic acid 1 part, water 4 parts, rinse in clean cold water, and nickel plate.

Formula for black nickel solution:

Double nickel salts	8 ozs.
Sodium sulphocyanide	2 ozs.
Zinc sulfate	1 oz.
Water	1 gal.

Operate the solution at room temperature, pH 6., using 1 volt, and 1½ to 2 amperes per sq. ft.

The work should not be dryed by using hot water and hot sawdust as it produces brown stains upon the deposit.

Use denatured alcohol and cold hardwood sawdust.

The deposit should be lacquered to protect the finish.

O. J. S., Problem 5,194.

Drain Valve for Aluminum Castings

Q.—We are making aluminum castings and are having trouble keeping the drain valve from burning out. We feed the melting pot at the top, and drain out the molten metal at the bottom just as it is done in foundries, but this plug soon burns out.

We have tried both steel and cast iron, but neither give very satisfactory results. If you can advise us some metal to use for this part, we shall appreciate it very much.

A.—An alloy used for such work with success is a chrome nickel alloy, such as is used for electric resistance wirelike heating elements. Most of these alloys are patented and they consist of approximately: 60 nickel, 12 chrome, 26 iron, 1½ manganese.

If you cannot get hold of a foundry casting this alloy, try cast iron low in silicon and phosphorus, containing 5% nickel. You will find this will give you a much longer life than either steel or cast iron.

W. J. R., Problem 5,195.

Etching Steel

Q.—We are desirous of obtaining complete information regarding the method used by certain manufacturers in trade marking their steel products.

Our company was impressed with the markings used by some of the large saw manufacturers, and if you can advise us how they trade mark their steel products, this information will be greatly appreciated.

USE THIS BLANK FOR SOLUTION ANALYSIS INFORMATION

Fill in all blanks if posible.

Date .....

Name and address: ..... **Employed by:** .....

Kind of solution: ..... **Volume used:** .....

Tank length: .....**width:** ..... **Solution depth:** .....

Anode surface, sq. ft.: ..... **Cathode surface, sq. ft.:** .....

Distance between anode and cathode: ..... **Kind of anodes:** .....

Clas of work being plated: ..... **Original formula of solution:** .....

REMARKS: Describe trouble completely. Give cleaning methods employed. Send small sample of work showing defect if possible.

Use separate sheet if necssary.

NOTE: Before taking sample of solution, bring it to proper operating level with water; stir thoroughly; take sample in 2 or 3 oz. clean bottle; label bottle with name of solution and name of sender. PACK IT PROPERLY and mail to METAL INDUSTRY, 116 John Street, New York City.

A.—What is known as the rubber stamp method is generally used in producing such marking as you refer to. With this method a rubber stamp is prepared with the mark or design and is used with a pad that holds a strong solution of caustic soda, 3 to 4 lbs. to a gallon of water.

The resist is made by dissolving gum ginacum in acetone to a consistency of thin varnish and to which is added a small quantity of an analine dye.

The work is thoroughly cleaned and dried. The resist is applied and allowed to dry. The rubber stamp is then moistened with the caustic soda solution and placed upon the resist for a few seconds. The caustic soda dissolves the resist and after this the work is washed with clean cold water and placed in the etching solution.

All exposed parts of the work must be protected by the resist. The etching solution is made as follows:

Nitric acid	32 ozs.
Muriatic acid	3 ozs.
Alcohol	6 ozs.
Water	96 ozs.

O. J. S., Problem 5,196.

Nickel on Die Castings

Q.—We are having trouble with our nickel solution. The solution was made up to nickel plate die castings and "unbreakable metal" prior to chrome plating. The deposit is black and streaky on the edges. When polished the deposit drags the composition on the surface, leaving black dirt and cutting through the nickel deposit.

If there is any factor that doesn't belong in the solution, can you tell me how to eliminate it and put the solution in proper condition?

A.—Analysis of nickel solution:

Metallic nickel	2.28 ozs.
Chlorides	1.91 ozs.
pH	6.8

Add 15 fluid ozs. of sulfuric acid to each 100 gallons of solution and 5 ozs. of sodium chloride to each gallon of solution.

G. J. S., Problem 5,197.

Polishing Wheel Speeds

Q.—Will you kindly let me know the proper speed in feet per minute required for coloring silver plated automobile reflectors?

Also let me know the proper speed in feet per minute required for cutting down brass automobile shells?

A.—For coloring silver plated reflectors, where the deposit of silver is quite thin the proper speed in feet per minute should be 2,000, with the proper type of wheel.

For cutting down radiator shells a speed to develop 5,000 feet per minute should be used. O. J. S., Problem 5,198.

Darkening Tin-Lead Composition

Q.—What can I use to darken a composition metal composed of 60 tin-40 lead?

A.—A blue black color can be produced upon this alloy in the following solution by dipping:

Hyposulphite soda	8 ozs.
Lead acetate	4 ozs.
Water	1 gallon

Use at boiling temperature.

If this is not satisfactory use following solution with the current:

White arsenic	8 ozs.
Caustic soda	2 ozs.
Sodium cyanide	6 ozs.
Water	1 gallon

Operate solution with steel anodes, room temperature with 1½ to 2 volts.

O. J. S., Problem 5,199.

Removing Sand by Acid Dip

Q.—We recently received an order for a quantity of refrigerator hinges in bronze. The buyer insists that the castings have good color and be entirely free of sand. We realize, of course, that sand blasting would meet the requirements. However, we do not have sand blast equipment and we have been informed that there is an acid dip, that will serve the purpose.

We would appreciate being furnished with any information you may have in reference to the acid formula, how it is to be used, and what type and size of containers are necessary.

Would you consider the acid dip economical compared to sand blast method?

These hinges are 2 inches wide and 6 inches long, how many hinges of this type can be dipped in 10 gallons of acid before the batch will have to be replenished.

A.—We suggest that you procure a water tumbler, wood lined, and tumble your brass castings with fine slag or brass skimmings. This will also clean your skimmings so you can recover your brass. Prepare a dip in the proportions of:

Oil of vitriol	1 gallon
Aqua fortis	1 "
Muriatic acid	2 ozs.
Water	1 quart

A handful of salt is sometimes added, or 1 or 2 ozs. of lamp black.

If your metal is sound you will have a nice bright color on your castings, but it will also show up all the defects.

After dipping in the acid dip, rinse in running water, then in hot water. Swing the castings so that they will dry, or dry in sawdust.

On a large scale, sand blasting would be cheaper.

W. J. R., Problem 5,200.

Streaky Rhodium and Verde Green

Q.—What is the cause of a streaky deposit of rhodium on watch cases or any other bright, polished object?

What is a formula for Verde Green?

A.—We are inclined to believe that the spotty or streaky deposit of rhodium is due to improper cleaning of the work before plating. We would suggest that you nickel plate the work 5 minutes or so before it is rhodium plated.

Formula for Verde Green:

Copper sulphate	8 ozs.
Ammonium chloride	8 ozs.
Sodium chloride	4 ozs.
Zinc chloride	1 oz.
Acetic acid	2 ozs.
Water	1 gal.

O. J. S., Problem 5 201.

Swedish Iron Finish

Q.—Are you in position to furnish us with information as to the process or formula in making what is known as half polished or Swedish iron finish for wrought iron lighting fixtures?

A.—In producing a Swedish iron finish on such work as yours the following method is used:

The scale or oxide is removed by pickling in a hot muriatic acid and then plated in a cyanide zinc solution.

It is then plated in an arsenic black solution, the highlights relieved by using a polishing wheel coated with No. 100 or No. 120 emery. This wheel is used dry and the work is lacquered to protect the finish.

The arsenic black solution is as follows:

White arsenic	8 ozs.
Caustic soda	2 ozs.
Sodium cyanide	6 ozs.
Water	1 gal.

The solution is used at room temperature with a low current density. Steel anodes are used in the solution.

O. J. S., Problem 5,202.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,899,701. February 28, 1933. **Alloy.** Robert H. Leach, Fairfield, Conn., assignor to Handy & Harman, New York.

1,899,906. February 28, 1933. **Method of Casting Readily Oxidizable Metals.** Arthur W. Winston, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

1,899,992. March 7, 1933. **Rack for Electroplating.** Erwin Sohn, Oak Park, Ill.

1,900,011. March 7, 1933. **Corrosion Preventing Attachment for Boats.** Harold L. Durham, Everett, Wash.

1,900,100. March 7, 1933. **Method of Welding Metals.** John Bernard Fitzpatrick, East Orange, N. J., assignor to Westinghouse Lamp Company.

1,900,112. March 7, 1933. **Grinding Machine.** Joseph H. Hoern, Saginaw, Mich., assignor to Wilcox-Rich Corporation, a Corporation of Michigan.

1,900,182. March 7, 1933. **Metallic Alloy.** Daniel D. Jackson, Brooklyn, N. Y., assignor to Remington Arms Company, Inc., a Corporation of Delaware.

1,900,220. March 7, 1933. **Production of Light Metals, Such as Magnesium.** Edwin O. Barstow, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

1,900,472. March 7, 1933. **Coating on Aluminum.** Martin Tosterud, Arnold, Pa., assignor, by mesne assignments, to Aluminum Colors Incorporated, Indianapolis, Ind.

1,900,534. March 7, 1933. **Electrolytic Apparatus.** Richard A. Wilkins, Beverly Farms, Mass., assignor to Industrial Development Corporation, Salem, Mass.

1,900,572. March 7, 1933. **Tubular Rivet Machine.** Charles E. Lyman, Waterbury, Conn.

1,900,665. March 7, 1933. **Die for Extruding Collapsible Tubes.** Walter Prussing, Brooklyn, N. Y., assignor to Victor Metal Products Corporation, Brooklyn, N. Y.

1,900,666. March 7, 1933. **Stripper for Collapsible Tube Forming Machines.** Walter Prussing, Brooklyn, N. Y., assignor to Victor Metal Products Corporation, Brooklyn, N. Y.

1,900,668. March 7, 1933. **Liquid Gun.** Harold A. Roselund, Toledo, Ohio, assignor to The De Vilbiss Company, Toledo, Ohio.

1,900,863. March 7, 1933. **Die Casting Machine.** Nathan Lester, Worcester, Mass., assignor to P. & R. Tool Company, Worcester, Mass.

1,900,746. March 7, 1933. **Babbitting Device.** Thor Thorsen, Plymouth Township, Hennepin County, Minn., assignor to Storm Manufacturing Company, Minneapolis, Minn.

1,900,893. March 7, 1933. **Automatic Silver Recovery Control.** Kenneth C. D. Hickman, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y.

1,900,938. March 14, 1933. **Method of Making Lined Bearings.** Edward P. Kerruish, Cleveland, Ohio, assignor to The Cleveland Graphite Bronze Company, Cleveland, Ohio.

1,900,960. March 14, 1933. **Method of Decorating Metal Surfaces.** Kenjiro Takeda, Osaka, Japan.

1,901,464. March 14, 1933. **Method of Insulating Zinc Spelter Baths and Means for Effecting Their Practice.** John A. Moritz, Crawfordsville, Ind.

1,901,471. March 14, 1933. **Rotary Conveyer System and Apparatus Therefor.** Kurt T. Potthoff, Brooklyn, N. Y.

1,901,531. March 14, 1933. **Electrodeposition of Platinum.** Alan Richard Powell and Arthur William Scott, London, England, assignors to Johnson-Matthey & Company Limited, London, England.

1,901,543. March 14, 1933. **Metallurgical Condenser.** George F. Weaton, Beaver, Pa., assignor to St. Joseph Lead Company, New York, N. Y.

1,901,820. March 14, 1933. **Solder Fittings and Method of Soldering.**

1,901,407. March 14, 1933. **Electrolytic Process for Producing Alloys of Lithium.** Hans Osborg, Frankfort-on-the-Main, Germany.

1,901,829. March 14, 1933. **Metal Aligning Device.** Henry J. Gaisman, New York, N. Y., assignor by mesne assignments, to Gillette Safety Razor Company, Boston, Mass.

1,901,450. March 14, 1933. **Sand Blast Machine for Applying Pressure to Abrasive.** Foster J. Hull, Hagerstown, Md., assignor to Panghorn Corporation, a Corporation of Maryland.

1,901,585. March 14, 1933. **Method and Means for Purifying Molten Metal.** Harcourt C. Drake, Hempstead, N. Y., assignor, by mesne assignments, to Sperry Products, Inc., Brooklyn, N. Y.

1,902,213. March 21, 1933. **Process of Reproducing Images on Metallic Surfaces.** John P. Brockway, Coronado, Calif., assignor to A. B. Bowman, San Diego, Calif.

1,902,503. March 21, 1933. **Process for Coating Metals.** Goodwin H. Howe, Scotia, N. Y., assignor to General Electric Company, a Corporation of New York.

1,902,621. March 21, 1933. **Zinc Coated Article.** Sidney H. Davis and Carl O. Anderson, Baxter Springs, Kans., William N. Smith, Platteville, Wis., and Herbert R. Hanley, Rolla, Mo., assignors to The Century Zinc Company, a Corporation of Ohio.

1,902,770. March 21, 1933. **Method and Apparatus for Tinning Connecting Rod Bearings.** William J. Fiegel, Detroit, Mich., assignor to Bohn Aluminum & Brass Corporation, Detroit, Mich.

1,902,905. March 28, 1933. **Process of Working Magnesium and High Percentage Magnesium Alloys by Rolling.** Gustav Schreiber, Bitterfeld, Germany, assignor, by mesne assignments, to Magnesium Development Corporation, a Corporation of Delaware.

1,903,130. March 28, 1933. **Chromium Plating Process.** William M. Phillips, Birmingham, Mich., assignor to General Motors Corporation, Detroit, Mich.

1,903,192. March 28, 1933. **Alloy of Nickel, Silver, Tin, and Copper.** Rudolf Ozlberger, Vienna, Austria.

1,903,346. April 4, 1933. **Composition for Refinishing Enameled Surfaces.** Gottleb Welsch, Sheboygan, Wis.

1,903,497. April 11, 1933. **Metallurgy of Copper.** Harry H. Alexander, Westfield, and Alexander W. Carroll, Elizabeth, N. J.; Henry L. Wheeler, Jr., Elizabeth, N. J., executor of said Alexander W. Carroll, deceased, assignor to said Harry H. Alexander.

1,903,778. April 18, 1933. **Etching Process and Composition for Use Therein.** Marcus F. Conroy, Luzerne, Pa., assignor of one-half to Luzerne Motor Company, Luzerne, Pa., a Copartnership consisting of Leo B. Corgan, William F. Corgan, and Michael H. Corgan.

1,903,842. April 18, 1933. **Aluminum Alloy.** Court C. Titus, New York, N. Y.

1,903,843. April 18, 1933. **Aluminum Alloy.** Court C. Titus, New York, N. Y.

1,903,860. April 18, 1933. **Preparation of Metallic Coatings.** Heinrich Gockel, Leverkusen-on-the-Rhine, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany.

1,903,897. April 18, 1933. **Apparatus for Casting Metals.** Henry Harris, London, England.

1,903,909. April 18, 1933. **Rotary Heat Treating Furnace.** Frank T. Cope, Arthur H. Vaughan, and Wilbur S. Bowling, Salem, Ohio, assignors to The Electric Furnace Company, Salem, Ohio.

1,903,944. April 18, 1933. **Casting of Aluminum Silicate Refractories.** Frederic William Schroeder, Louisville, Ky., assignor to Corhart Refractories Company, Louisville, Ky.

1,903,952. April 18, 1933. **Welding Rod and Process of Making the Same.** William A. Wissler, Jackson Heights, N. Y., assignor to Haynes Stellite Company, a Corporation of Indiana.

Equipment

New and Useful Devices, Metals, Machinery and Supplies

Riverside Beryllium Copper

The Riverside Metal Company, Riverside, Burlington County, New Jersey, has entered upon the manufacture of beryllium copper in every variety of sheet, strip, wire and rod. This company has long been known for its phosphor bronze and nickel silver, a description of its plant and products having appeared in THE METAL INDUSTRY for August, 1932, pages 310-314.

The literature on the subject of beryllium explains how it is possible, by the addition of small quantities of beryllium to copper, to obtain exceptionally high fatigue limits, greatly improved values in electrical conductivity compared to steel and other high tensile strength metals, corrosion resistance equal to that of the wrought copper-tin alloys, and exceptional ductility in the quenched state. Beryllium copper containing about 2.25 per cent beryllium, balance copper, can be heat-treated (precipitated hardened). For example, a piece of hard drawn beryllium copper wire which had an original tensile strength of 108,000 pounds per square inch was heat-treated to 190,000 pounds per square inch.

Beryllium copper containing 2.25 per cent beryllium has an electrical conductivity of about 25 to 30 per cent of that of standard copper. Higher conductivities can be obtained, up to 40 per cent, at some sacrifice of tensile strength.

The heat treatment of beryllium copper is not complicated. The annealing temperature is between 500 and 600 degrees F. If re-working or re-processing the fabricated alloy is necessary, it can be effected by heating to between 1,450 to 1,475 degrees F., for about a half hour. Cooling by quenching in cold water should follow immediately.

Riverside beryllium copper is not more difficult to machine than any other high strength metal. It can be brazed, soft-soldered, swaged before tempering and silver soldered. It has a resemblance to pure gold in appearance and is recommended for the following uses: contact clips for cord sets; contact pins for appliances; stove and range switches and contacts; circuit breaker springs and contacts; contact pins for appliances; wall switch springs and contacts; brush holder springs and contacts; watt hour meter springs and contacts; relay springs and contacts; connector grips; instrument springs generally; thermostatic control springs; signalling apparatus springs; pressure reducing valve springs; fountain pen clips; radio tube sockets; diaphragms; vacuum jet tips and nozzles; oil burner jet tips; non-sparking chisels, wrenches, screw drivers and mechanics' tools generally; high duty non-ferrous pinions and gears; fuse clips; bellows; jewelry stock; high duty valve sleeve and seats.

Complete information on this product is obtainable by writing directly to the manufacturer. Please mention this notice.

New Boiler Feed Unit

Mears-Kane-Ofeldt, Inc., Philadelphia manufacturers of gas-fired steam boilers and boiler feed units, announce the "New" M-K-O Automatic Boiler Feed Unit.

This unit, it is stated, will not only pump feed water against high boiler pressure (and so feed it so as to maintain a constant water level), but will also return condensation to the boiler, and supply make-up water, as and when required; also assure the maintenance of a constant water level, without fluctuating steam pressure.

M-K-O Automatic Boiler Feed Unit

Following are the features claimed for the "New" M-K-O Automatic Boiler Feed Unit:

1. A new, more efficient, high-speed motor driven turbine pump replaces the old style tandem pumps.

2. A new "flat" head, supporting valve and float of make-up water control is used in place of the former larger and more cumbersome device.

3. New angle iron supports (legs)—bolted to brackets welded to the tank—make a stronger, more compact and neater job, requiring less floor space.

Complete information on this product is obtainable by writing directly to the manufacturer. Please mention this notice.

Latest Products

Each month the new products or services announced by companies in the metal and finishing equipment, supply and allied lines will be given brief mention here. More extended notices may appear later on any or all of these. In the meantime, complete data can be obtained from the companies mentioned.

High Powered Small Sized Motor. Under 12 inches in diameter; 100 horsepower. Louis Allis Company, Milwaukee, Wis.

Doublenclosed Explosion-Proof Motor. An inner frame completely encloses the electrical windings, stator, rotor, antifriction bearings and bearing chambers, sealing these parts against attack. U. S. Electrical Manufacturing Company, Los Angeles, Calif.

Battery for Potentiometers. The Brown Compensated Air Cell, having a constant current output and a life of over 2½ years. Brown Instrument Company, Philadelphia, Pa.

Splash Proof Motor. Specially designed for plants in which water and other liquids may be splashed on the equipment. Ideal Electric and Manufacturing Company, Mansfield, Ohio.

High Temperature Gas Furnace. A small muffle furnace for laboratory and small shop work up to 2600° F. Distributed by R. G. Hess, 25 Church Street, New York City.

High Speed Precision Flying Shear. Used for light gauge cold strip up to 36 inches wide and from 0.006 to 0.025 inches thick. United Engineering and Foundry Company, Pittsburgh, Pa.

Chrome Nickel Silver. A nickel silver sheet with a chromium coating bonded to it. American Nickeloid Company, Peru, Ill.

Rubber-Lined Valve. Vulcalock valve, designed for handling corrosive and abrasive fluids under conditions of fairly high pressure, pulsating pressure, throttling or suction. B. F. Goodrich Rubber Company, Akron, Ohio.

Air Condition Indicator. The Airguide, an instrument for showing on dials the temperature and relative humidity of indoor atmospheres.

Aluminum Oxide for Floors. Alundum (C.F.) Aggregate, consisting of chips or particles of ceramically bonded aluminum oxide abrasive for use in cement or asphalt flooring to add hardness, toughness and a permanently non-slip surface. Norton Company, Worcester, Mass.

Transparent Cup Goggles. A new type of goggle which permits the wearer to perceive objects through them; the "blinder" feeling is said to be entirely eliminated. Willson Products, Inc., Reading, Pa.

Radial Pumps. For generating pressure in operating hydraulic power machinery designed especially for application to heavy duty production machines requiring high pressures. Hydraulic Press Manufacturing Company, Mount Gilead, Ohio.

Industrial Motors. A line of electric motor-driven speed reducers. Each machine incorporates a motor element and reduction spur gear trains. Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

Lining for Burnishing Barrels

Users of ball burnishing barrels will be interested in the superior results claimed for the new Abbott Self-Locking Copper Lining (patent applied for) now being marketed by The Abbott Ball Company of Hartford, Conn.

The design of the lining is said to set up additional movement in the barrel, giving a quicker finish; also to act as a burnishing medium, bringing a new effectiveness to the mechanical burnishing process.

Preliminary tests in customers' plants, it is stated, show that substantial savings have been made both as regards production and maintenance.

Radiation Tube

A radiation tube designed to replace rod thermo-couples for radiation pyrometers, has been developed by the Pyrometer Instrument Company, 103 Lafayette Street, New York. This tube, called the Pyro, is a compact, self-contained unit enclosed in a dust and moisture proof chromium plated metal housing. The thermocouple bulb develops its energy by having focused on it, through a quartz lens, the radiant heat and light rays from the body to be measured. Temperatures measured range from 1,300 to 3,600 degrees F. The following advantages are claimed.

1. The tube is not subjected to the immediate furnace heat, consequently not influenced by dangerous gases, fumes, etc.
2. The radiation being absorbed by a minute thermocouple which reacts instantly, the usual time lag is reduced to a minimum so that temperature changes can be recorded more accurately.
3. It can be installed successfully to record temperatures in places impossible to reach with thermocouple wires.
4. It is not subject to the shortcomings of metal wires, which deteriorate when heated beyond rated capacity.
5. Its life exceeds by far that of rare metal couples, but should the tube become damaged through accident, the bulb can be replaced at a very nominal expense.

Powdered Solder—Correction

In our April issue we described a new powdered solder called Lotan. The name of the manufacturer of this solder was misspelled. The correct name is the Robertson Davis Company, 361 West Superior Avenue, Chicago, Ill. The distributor of this material is Ohio Lotan Products, 200 Columbian Bldg., AD. 8247, Columbus, Ohio.

New Electron Tube Device Locates Cracks in Wire and Tubing

Flaws and cracks in tungsten or molybdenum wire, copper tubing, and similar materials, are detected by a new vacuum tube oscillator developed by the General Electric Company, Schenectady, N. Y. This device has already been found of great value, it is stated, in the manufacture of

Electrical Tube Tester

General Electric products where the visual detection of small defects is a very slow process, requiring extreme care, and is often entirely inadequate.

Although originally designed to locate longitudinal cracks in tungsten or molybdenum wire, the device is being successfully used in the General Electric shops to find flaws in copper tubing. In both cases, flaws are detected by means of eddy currents induced in the material inspected.

The tubing test is based upon the change in electrical resistance of a small section of tubing, which occurs when a defect is included in it. Eddy currents are induced in a small portion of the tubing by passing it through a coil connected in a Dynatron oscillator circuit. Two of these oscillators are coupled together and connected through an amplifier to a loudspeaker and a meter. Each of the oscillators is provided with a coil either or both of which may be used as test coils through which to pass the tubing. With a good section of tubing in the test coils, the oscillators are both tuned to the same frequency. Then, as the tubing is passed through the coils, a flow will change the induced current sufficiently to change the frequency of one of the oscillators and cause a beat note in the loudspeaker and a deflection of the meter.

The equipment in its present form detects local flaws and sudden changes in characteristics of the material. By using one test coil instead of two, however, it may be used to detect gradual changes in characteristics or to compare the material with a standard. The device may be used to operate a loudspeaker, a meter, or a thyratron tube and relay.

Small Fast Grinder

A new air grinder, small enough to be concealed in the palm of one's hand, yet having a tested grinding speed of 40,000 revolutions per minute, has just been announced by the Madison-Kipp Corporation, Madison, Wis.

The new tool, known as the Blue Midget, weighs only seven ounces. It has been developed by Madison-Kipp to fill the need for a small, yet exceptionally efficient air grinding tool for all light work and intermittent service. Company officials state that they are offering the new model at a special low price so that every tool maker, die maker and mechanic can have one on his own bench.

Before leaving the Madison-Kipp plant, every Blue Midget must prove itself able to hit the musical note of high F sharp. Through the method known as "tone testing," vibrations per minute are automatically transferred to revolutions per minute, thus furnishing an accurate and reliable verification of the Blue Midget's 40,000 R.P.M. speed.

Included with the new model, at no extra charge, are eight feet of air hose, grinding wheel, a bottle of Kipp oil and Kipp syringe type pressure oiler. All Kipp air tool accessories and wheels having ⅛-inch diameter shanks can be used with the Blue Midget.

Madison-Kipp states that its line of air grinders has now been rounded out to contain models for every service requiring wheels up to 1½ inches in diameter. New low prices have been announced on all models.

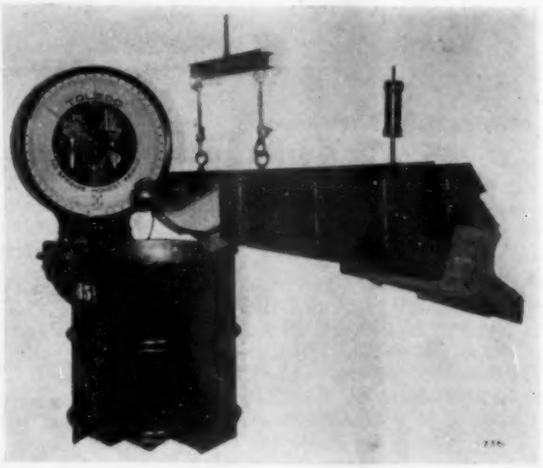
Manufacturing Jewelers' Equipment

A wide line of equipment and accessories for manufacturing jewelers is made by J. Goebel, 95 Bedford Street, New York. This line includes ingot molds for precious metals, casting crucibles, blow pipes, spot plates, touchstones, gold scales, gold testing needles, acid bottles, crucible tongs, and melting furnaces.

This company manufactures in addition a flux for smelting polishings, sweeps, filings, dental gold, gold beaters' wastes, etc. This flux is stated to have no reaction with sand crucibles and to separate metal from the slag cleanly. It does not attack platinum. It is intended for use without additions of any kind.

Automatic Weighing of Small Parts

Manufacturers who have had difficulty in the packing of products, such as nails, pins, washers, nuts, etc., can now, it is claimed, obtain greater accuracy, lower labor costs, and greater time-savings through the use of the new Toledo Vibrator Filling Machine, recently announced by Toledo Precision Devices, Inc., Toledo, Ohio. This



New Toledo Vibrator Filling Machine for Automatic Weighing.

new device controls the automatic feed of materials from supply bins to the scales and the automatic weighing out of predetermined amounts in packing operations.

The new Toledo Vibrator Filling Machine consists of a Toledo scale of a high degree of accuracy, an "electric eye" cut-off attachment, and a vibrator holding the articles to be packaged. It is simple to operate.

So accurate is the scale said to be that the precise weights guarantee accuracy in the number of articles packed in cases when they are sold by number. This device improves upon human hands by stopping the commodity before there is any waste through overweight. Time-consuming hand operations with their large and costly errors are eliminated.

Pack-Morin, Inc.

Pack-Morin, Inc., 261 Fifth Avenue, New York, has been established by Charles Pack and Louis Morin, to provide a complete engineering service covering plant management including solution of chemical, metallurgical and mechanical problems, automatic machine design of all kinds, including vending equipment and machines for pressure casting zinc, aluminum, magnesium, brass and cellulose products. Mr. Pack was formerly for 18 years first vice-president of Doehler Die Casting Company, and is widely known as a pressure casting specialist. Mr. Morin has been a consulting mechanical engineer for 17 years, and was for two years chief plant engineer of the Chemical Warfare Service, U. S. A.

Equipment and Supply Catalogs

Available free on application to the manufacturers mentioned, unless otherwise stated. Please mention this notice.

Lathes. South Bend Lathe Works, South Bend, Ind. Circular 9-G, new toolmaker's lathe.

Pickling Equipment. Klaas Machine and Manufacturing Company, 4313 East 49th Street, Cleveland, Ohio. Tanks, steam jets, baskets, etc.

Plating Brighteners. E. Wambaugh Company, Goshen, Ind. Circular on brighteners for nickel, brass, bronze and copper plating solutions.

Costs. The Linde Air Products Company, 205 East 42nd Street, New York. Bulletin on how to figure welding and cutting costs; with illustrations and tables.

Chemicals. The Grasselli Chemical Co., 350 Fifth Ave., New York. A complete catalog of chemicals, spray products, cadmium and zinc plating supplies, and other products used in finishing.

Lighting Control. Westinghouse Electric and Manufacturing Company, Cleveland, Ohio. Illustrated bulletin on "Photolux," a device for turning lights on or off in relation to available daylight.

Polishing Equipment. The Cleveland Container Company, Abrasive Division, 10630 Berea Road, Cleveland, Ohio. Bulletin A-100 on "Nolap" abrasive sleeves and expanding polishing wheels. Illustrated.

Electrical Equipment. Columbia Electric Manufacturing Company, 1292 East 53rd Street, Cleveland, Ohio. Two new bulletins on instruments for measuring current; bulletin on small and medium sized A.C. generators for lighting, power, etc.

Cyanides. R. & H. Chemicals Dept., E. I. du Pont de Nemours & Co., Wilmington, Del. A very complete booklet on the use of metal cyanides in electroplating solutions. Considerable technical information, and formulas for various solutions are included.

Superchrome. Electroplaters' Technical Institute, 619 Wellington Ave., Chicago, Ill. Leaflet on a new process of chromium plating by means of a solution which is said to contain no sulphates or sulphuric acid. It is also said to have a wide bright plating range.

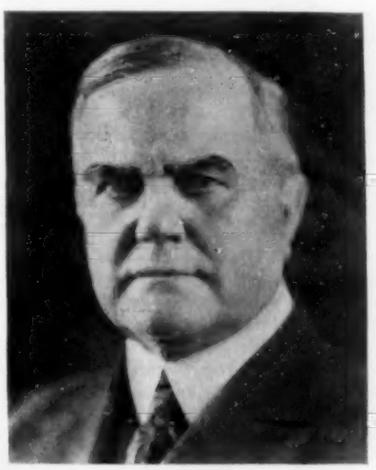
Foundry Exhibition. C. E. Hoyt, American Foundrymen's Association, 222 West Adams Street, Chicago, Ill., has issued a booklet, "Confidence," which gives replies to a questionnaire regarding the equipment exhibition held in connection with the annual convention of the A. F. A.

Personals

Edward J. Cornish

Edward J. Cornish was recently elected chairman of the board of directors and of the executive committee of the National Lead Company, New York. Mr. Cornish had been president of the company since 1916. He is also vice-president of Patino Mines and Enterprises, Consolidated, Inc., a leading producer of tin.

Mr. Cornish was born at Sydney, Iowa, December 15, 1861. After attending the



EDWARD J. CORNISH

public schools in Iowa, he went to Tabor College, also in that state, to study for three years, after which he entered the Iowa State University, from which he graduated three years later with an A.B. degree, and a year later took an LL.B. degree from the university's law department. Mr. Cornish went into law practice at Omaha, where he remained until 1906, when he gave up active legal work.

In 1903 Mr. Cornish had become president of the Carter White Lead Company, in connection with his duties as attorney

for the estate of Levi Carter. In 1905, under his leadership, the Carter company put up a large plant at Montreal, under the name of Carter White Lead Company of Canada, Ltd., which the United States company controlled. It was the first lead corroding plant in Canada, and proved highly successful.

In 1906 Mr. Cornish sold the Carter White Lead Company to the National Lead Company, remaining president of Carter for another two years. Then he was elected to the National Lead directorate, and became manager of the Chicago branch. In 1910 he went to New York as vice-president and a member of the company's executive committee. He became president in 1916.

Mr. Cornish, has, of course, always looked after the legal and financial ends of the company's business, being a lawyer and financier. But he has steadily maintained an interest in the manufacturing side of the business as well, and he is credited with instituting some of the most important reforms in the company's production methods, especially with regard to employee safety. For some years he has been a member of the General Administrative Council of the American Association for Labor Legislation. Among his business interests he numbers a directorship in the Chase National Bank, New York, and the Anglo-South American Trust Company.

Mr. Cornish was married in 1909 to Mrs. Levi Carter, who was Selina C. Bliss, daughter of George H. Bliss of Chicago.

David C. Griggs has been re-elected president of Waterbury-Farrel Foundry and Machine Company, Waterbury, Conn. **W. S. Fulton** was re-elected chairman of the board.

Frank W. Bishop of Cleveland, Ohio, has resigned as secretary and managing director of Wheeling Metal and Manufacturing Company, Wheeling, W. Va., makers of metal sheet and wire products, lead clad steel and similar products. **Lewis J. Rose** is in charge.

F. M. Carter, formerly for six years vice-president of the National Lead Company, New York, has been elected president, to succeed Edward J. Cornish (see page 179). Mr. Carter is a nephew of the founder of the Carter White Lead Company, which was acquired by National Lead in 1906.

V. D. Green, manager of the Technical Advertising Bureau, Western Reserve Building, Cleveland, Ohio, recently gave a talk at John Huntington Polytechnic Institute, Cleveland, in which he outlined promotional methods for engineering and industrial products. "Above all," he urged, "give them facts, —practical, usable information about your product."

James Kniveton has joined the engineering staff of Ajax Electric Company, Inc., Philadelphia, Pa. He was formerly for 11 years with Ryan Scully and Company, Philadelphia, in charge of electric heat treating furnace design, and before that was with Leeds and Northrup Company, Philadelphia, for six years, working on application of pyrometers to industrial heating equipment.

As we go to press we learn that **William Voss,** who has been representative for the Boissier Electric Corporation, New York, for the past six years, has just severed his connection with that company. Mr. Voss' address is 8620 130th Street, Richmond Hill, Long Island, N. Y.

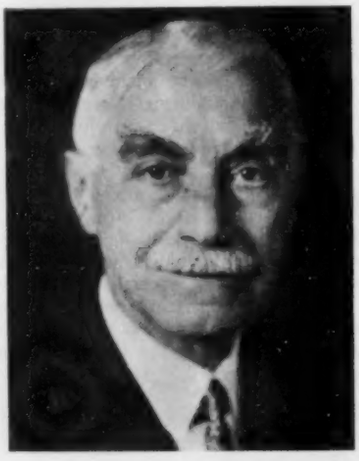
Fred B. Jacobs recently became associated with the Cleveland Container Co., Abrasive Division, manufacturer of abrasive sleeves and expanding polishing wheels, Cleveland, Ohio, as general sales and advertising manager. Mr. Jacobs has been connected with the abrasive industry for the past twenty-five years. He joined the sales force of the Carborundum Co., Niagara Falls, N. Y., in 1908 and was connected with that company for several years. Mr. Jacobs is the author of several practical books on grinding.

Obituaries

Leopold Plaut

Leopold Plaut, widely known manufacturer and philanthropist, died last month at his home in New York City after an illness of several months. He was 72.

Mr. Plaut began his manufacturing career in 1887, when he formed L. Plaut and Company, New York, to manufacture



LEOPOLD PLAUT

gas and electric lighting fixtures. This company was eminently successful under Mr. Plaut's ownership and that of his brother, Herman Plaut, who joined the firm a few years after its establishment. In 1892 the associated firm, Black and Boyd Manufacturing Company, was formed as a manufacturing and sales organization, and in recent years the interests of both companies were merged. Mr. Plaut continued with Black and Boyd, and was chairman of the board of directors when he died. For many years he was also a director of the Merchants' Association of New York.

Waldo Lincoln

Waldo Lincoln, years ago a manufacturer of copper products at South Worcester, Mass., died April 7, 1933, at Worcester, Mass., aged 83. He retired from manufacturing in 1883.

John A. McCabe

John A. McCabe, sales representative of Charles F. L'Hommedieu and Sons Company, Chicago, Ill., manufacturers of plating and polishing equipment and supplies, died March 17, 1933, of cancer. Mr. McCabe was one of most popular men in the plating equipment business, and was widely known to platers and supply men throughout the country. Active at all conventions of the American Electroplaters' Society, he helped organize the International Fellowship Club in 1924 at the Milwaukee convention of the A. E. S., and was president of the Fellowship Club in the year 1930-31.

William F. Lemon

William F. Lemon, 46 years old, proprietor of a metal stamping works at 27 Wilson Street, Trenton, N. J., died re-recently of acute indigestion at his plant. Mr. Lemon lived at 415 Ardmore Avenue, Trenton. He is survived by a family. He was a veteran of the World War. C. A. L.

Norman F. Thompson, Jr.

Norman F. Thompson, Jr., president of the Gilbert Clock Company, Winsted, Conn., died April 2, 1933, aged 49. Mr. Thompson started in the Burson plant at Rockford, and rose to be head of the concern. He was a former president of the Clock Manufacturers Association of America.

Elias G. Pearlman

Elias G. Pearlman, president of the Enterprise Galvanizing Company, Philadelphia, Pa., died April 5, 1933, of a stroke after 18 months' illness. Mr. Pearlman was active in the galvanizing business for 30 years.

Thomas J. Shallue

Thomas J. Shallue, formerly plant superintendent of the Bridgeport Brass Company, Bridgeport, Conn., died in that city April 17, 1933, aged 62.

News of Associations and Societies

American Foundrymen's Association

1933 Convention at Chicago

The 1933 Annual Convention and Exposition of the American Foundrymen's Association will take place June 20 to 23, inclusive, at the Stevens Hotel, Chicago, Ill. Foundrymen from all parts of America are planning to visit the Century of Progress exposition in time to allow their attending the convention.

A Foundry Equipment Exposition will be held under the direction of committees of the Foundrymen's Association and the Foundry Equipment Manufacturers' Association. It is expected that there will be more new products and equipment on exhibition than has ever before been shown at the annual conventions. The exposition will be in the Stevens Hotel also.

Program Covers All Subjects

All aspects of the foundry industry will be dealt with at the various sessions and group discussions planned for the convention. Each division will have several meetings at which important papers will be heard. A good nonferrous program is being prepared. Informal round-table discussions will give practical foundrymen an opportunity to exchange ideas on operating problems. Shop courses are another significant feature of the 1933 program. These courses have proved highly popular since their initiation in 1928, and their value has been proven.

Meetings of Other Groups

The week of June 26, immediately after the Foundry Convention week, two technical societies cosely related to the foundry and other metal fabricating industries will open their annual meetings at Chicago. These are the American Society for Testing Materials, and the American Society of Mechanical Engineers. Metallurgists and engineers connected with the foundry industry will be enabled to attend the meetings of the other societies, according to their interests. The A. F. A. will join in a symposium with the A. S. T. M. There will be two such joint meetings, one the latter part of the Foundry Convention week, and another early the following week. A third joint meeting will be held by the A. F. A. and the A. S. M. E. Materials Handling Division, during the Foundry Convention week. In addition, the A. S. M. E. will hold a special foundry practice session during its own Chicago meeting.

The Century of Progress management has designated June 19-25 as Science Week, and June 26-July 1 as Engineering Week due to the presence of these and other technical societies for conventions and meetings during those weeks. There will be special programs of international participation during these weeks, and the A. F. A. will co-operate in these.

Complete programs and other data of interest to the nonferrous foundry industry will appear in our June issue.

Foundry Conference

Michigan State College, Lansing, Mich., in cooperation with the Detroit Foundrymen's Association, held a three-day foundry conference April 6-8, at which a course in foundry practice fundamentals was given. The program included papers on various phases of ferrous and nonferrous foundry work, and an address by S. W. Utley, past-president of the American Foundrymen's Association. The nonferrous session with Vaughan Reid of City Pattern Works, Detroit, as chairman, included the following papers:

Aluminum Melting, by T. D. Stay, Aluminum Company of America, Pittsburgh, Pa.

Heat Treatment of Aluminum Alloys, by H. J. Deutsch, U. S. Aluminum Company, Cleveland, Ohio.

M. T. Mortenson of W. W. Sly Manufacturing Company, Cleveland, gave a paper at a general session on **Cleaning Castings.**

Connecticut Non-Ferrous Foundrymen's Association

The meeting on April 10 brought out one of best attendances we have had. The speaker of the evening was Ernest G. Jarvis, president, Niagara Falls Smelting and Refining Company, Buffalo, N. Y. He spoke on "Fluxes and Addition Agents." After the address there was a round-table discussion in which Mr. Jarvis joined and answered numerous questions. The high educational value of the meeting was clear. C. H. Blanchard of Reading, Pratt and Cady Company, Hartford, presided.

The next meeting will be on May 8, at the usual place, Hotel Garde, New Haven, after dinner there. This will be the last meeting until October. W. M. Saunders of Providence, R. I., who was originally scheduled for the April meeting, will speak on Foundry Sands at the May meeting.

L. G. TARANTINO
523 West Taft Avenue, Bridgeport, Conn.

American Electroplaters' Society

1933 Convention Program

The Executive Committee of the Chicago Branch of the American Electroplaters' Society, which is in charge of the 1933 annual convention of the Society, to take place at the Congress Hotel, Chicago, Ill., June 27 to 30, inclusive, has announced the tentative program for the convention.

Educational Sessions will be held on all four days, the first beginning at 1:00 P. M. Tuesday, June 27, and the remaining three at 9:00 A. M. each day. The latter three sessions will take up the mornings only. All sessions will be held in the hotel's Florentine Room. The papers thus far scheduled for presentation are:

Technical Papers

A Century of Progress in Plating.
Modern Etching Methods.
Impurities in Nickle Solutions.
Practical Methods and Materials for Cleaning before Plating.
Plating of Die Castings.
The Use of Acids in preparing Steel for Plating.
Cadmium Plating with full Automatic.
Spray Prevention by the use of Fixed Oils in Chromium Plating.
Prevention of Corrosion on Laboratory Apparatus.
Report of results of Exposure and Accelerated Test of Plated Coatings.
Summary Report of Research at Bureau of Standards.

Entertainment

The program of entertainment has been arranged as follows:

TUESDAY, June 27—8 P. M. Boat ride along Chicago's Lake Front. Steamer Roosevelt, capacity 2,500. Boat chartered. Dancing and entertainment on boat. Return at 11:30.

WEDNESDAY, June 28—Afternoon and evening at the Century of Progress exposition. Everyone on their own.

THURSDAY, June 29—Afternoon, plant visitation and Stock Yards tour.

FRIDAY, June 30—Afternoon, auto sightseeing trip. Evening, Annual Banquet, Gold Room, Congress Hotel.

For the Ladies

TUESDAY, June 27—Visit to Merchandise Mart and National Broadcasting Studios.

WEDNESDAY, June 28—Afternoon and evening at Century of Progress exposition.

THURSDAY, June 29—11 A. M., trip through Marshall Field & Company store, with luncheon and style show at 1 P. M. Evening, lecture at Adler Planetarium.

FRIDAY, June 30—2 P. M., auto sightseeing trip. 7 P. M. annual banquet.

Regarding the program, the committee says:

"The boat ride on the first evening will give a view of the Century of Progress at night with its wonderful illumination.

"The ladies' trip to the Merchandise Mart and N. B. C. Studios will be most interesting.

"The plant visitations and trip through the Stock Yard will be well worth the effort.

"The afternoon and evening at the Century of Progress will be long remembered.

"The Ladies' Style Show at Marshall Field and Company—well, you know how they put on a show.

"The lecture at the Adler Planetarium is something that can be had in no other place on the continent."

Research Fund

Contributions to the Research Fund of the American Electroplaters' Society in March amounted to $40. The contributors were:

John King, Dayton, Ohio, $5; Oneida Community, Ltd., Sherrill, N. Y., $25; Agfa Ansco Corp., Binghampton, N. Y., $10.

The banking situation and other financial uncertainties undoubtedly interfered with contributions. It is hoped that there will be an early improvement in the support of this highly important work in the interest of the advancement of the science of electroplating. Contributions may be sent to Walter Fraine, 507 Grand Avenue, Dayton, Ohio, secretary-treasurer of the Research Committee.

Electrochemical Society

The 63rd meeting of The Electrochemical Society is being held May 11, 12 and 13, at the Hotel Windsor, Montreal, Canada. A full report giving the tentative program was published in our previous issue. Additional papers on subjects of interest to our readers which have since been put on the program are:

"A Study of Cyanide Zinc Plating Baths Using the Aluminum Mercury Zinc Anode," by A. Kenneth Graham.

"Tercod—A New Refractory for Electric Furnaces," by G. S. Diamond.

"The Electric Furnace and Its Products in the U. S. S. R.," by C. H. Vom Baur.

"A Study of Manganese-Tin Alloys at Room Temperature," by Alan N. Campbell and H. Dyson Carter.

"Molybdenum Contamination of Nickel Crystals," by A. Dingwall, J. Zacharias and C. L. Spiegel.

Oil Burner Show

American Oil Burner Association will hold the 10th National Oil Burner Show and Convention at Hotel Stevens in Chicago, June 12 to 16. The association expects to attract 5000 dealers.

Exhibitors at the show will include the United States Bureau of Standards; Chase Brass and Copper Company; Detroit Lubricator Company; General Ceramics Company.

British Institute of Metals

The Twenty-third Annual May Lecture of the Institute of Metals of Great Britain was delivered by Albert Portevin, President of the Société des Ingénieurs Civils de France, on May 10, at the Institution of Mechanical Engineers, London. The subject was "Quenching and Tempering Phenomena in Alloys."

Mechanical Engineers

The American Society of Mechanical Engineers, 29 West 39th Street, New York, will hold its semi-annual meeting at the Palmer House, Chicago, the week of June 26. Sessions will be held on aeronautic engineering, printing, fuels, machine shop practice, and other phases. A paper scheduled for the aeronautic session Tuesday, June 27, at 2:15 p. m., is "The Resistance Welding of Aluminum and Its Alloys," by Bohn and Hoglund.

American Welding Society

The annual meeting of the American Welding Society will be held April 27-28, at the Hotel Governor Clinton, New York City. "Welding—a Factor in Industrial Revival" is the title of an address to be delivered at the Friday morning session by Willard T. Chevalier, publishing director, "Engineering News Record" and "Construction Methods." Other features include addresses by Professor F. P. McKibben on Erecting Steel Buildings; and Charles F. Abbott on Co-operation Among Industries; Committee Reports on Pressure Piping and The Use of Welded Steel Parts in Machinery Construction, a meeting of the American Bureau of Welding, and the award of the Samuel Wylie Miller Memorial Medal.

Industrial and Financial News

Aluminum Co. Appeal Is Denied in Supreme Court

The United States Supreme Court on April 17 denied the appeal of the Aluminum Company of America, Pittsburgh, Pa., from the order of the Federal District Court for Connecticut to produce its records as requested by Baush Machine Tool Company, Springfield, Mass. The request was in connection with the Baush suit against the Aluminum Company for price-fixing and other alleged illegal practises. The Supreme Court decision paves the way for court test of the charges.

Phelps Dodge Producing to Meet Demand Only

Phelps Dodge Corporation, New York, a leading copper producer, is producing metal in volume sufficient to meet the needs of its manufacturing subsidiaries and regular customers, according to Louis S. Cates, president. Company's production is now about 4,000,000 pounds monthly, as against 6,400,000 pounds a month in 1932. Mr. Cates said surplus stocks can be cleared up only by a resumption of business. He looks for improvement within six months.

Receiver for Beardsley and Wolcott Company

James R. Sheldon of New York, president of the Waterbury Clock Company, was appointed temporary receiver of Beardsley & Wolcott Manufacturing Company, Waterbury, Conn., on March 31. Mr. Sheldon furnished bond of $50,000. The company is solvent and the move for the appointment of a receiver was taken to preserve the assets of the concern and to keep the plant in operation. Congressman E. W. Goss, Charles L. Campbell of Hartford, C. L. Berger and Emil Mannweiler of Naugatuck, Henry R. Adams of St. Petersburg, Florida, and H. William Reid of Elgin, Illinois, were among the petitioners.

Beardsley & Wolcott was formerly the Berbecker & Rowland Company. It employs several hundred persons in manufacture of brass novelties. W. R. B.

Flour City Company Out of General Bronze Merger

Flour City Ornamental Iron Company, Minneapolis, Minn., has reacquired all business assets in that city formerly held by General Bronze Corporation, New York, according to Eugene Tetzlaff, president.

The Flour City company does a national business. It operates one of the largest plants in the country for manufacture of ornamental iron, bronze, aluminum and other metals, and has its own foundries, modeling and fitting shops, rolling, stamping, spinning, tinning, zincing, soldering, brazing, plating, finishing and other departments. It entered into a merger with General Bronze in 1929. In March of this year the company withdrew from the merger, according to Mr. Tetzlaff.

Officers and directors of the Flour City company are: Eugene Tetzlaff, president; H. C. Baldry and Walter Tetzlaff, vice-presidents; H. J. Niels, secretary-treasurer; Mr. Westphal, assistant secretary-treasurer; Ernest Rubbert, director.

New Type Galvanized Wire Made by Bethlehem Steel

Shipments of a new kind of galvanized wire, using a new patented electric process, marketed under the trade name "Bethanized", were started last month from the Maryland plant of Bethlehem Steel Company, Sparrows Point, Md.

This wire does not supplant hot dipped galvanized wire, but is manufactured for special purposes, such as telephone lines, where the wire is submitted to unusual bending and twisting, and where high resistance to corrosion is a factor, it is stated. One of the initial shipments was an order of 11,000 pounds for the Zoo in Washington, D. C.

Magnesium Sales Gain

United States Bureau of Commerce, Washington, D. C., reports sales of magnesium ingot in 1932 totaled 191,699 pounds, valued at $228,653. This represents increases of 36.3% in quantity and 14.5% in value over the 1931 figures.

All primary magnesium produced in this country last year was from magnesium chloride recovered from salt wells of the Dow Chemical Company near Midland, Mich., it is stated.

Celebrate Nickel Discovery

The fiftieth anniversary of the discovery of nickel deposits at Sudbury, Canada, which have grown into a world industry, was celebrated April 6th at the 34th annual banquet of the Canadian Institute of Mining and Metallurgy. President Robert C. Stanley of The International Nickel Company of Canada, Ltd., addressed the gathering.

Galvanized Sheet Exhibit

Thousands of farmers and others have seen the exhibit of galvanized roofing and siding placed at fairs and other exhibition places throughout the country during the past few months by American Zinc Institute, New York. Heavy coated sheets bearing the Institute's "Seal of Quality" are said to be steadily gaining in preference over sheets with lighter coatings.

Corporation Reports

Corporations reported profits or losses after charges as follows, with comparative figures:

Annual Reports

Anaconda Wire & Cable Co., New York: 1932, net loss, $1,045,110; 1931, profit, $18,680.

Art Metal Works, Inc., Newark, N. J.: 1932, net loss, $71,759; against 1931 net loss, $149,380.

British Aluminium Co., Ltd., England: 1932, profit, £112,160; 1931, profit, £112,427.

Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.: 1932, profit, $20,795; 1931, loss, $56,971.

Evans-Wallower Lead Co., Charleston, W. Va.: 1932, loss, $109,206; 1931, loss, $319,312.

Remington Arms Co., Inc., New York: 1932 loss, $794,242; 1931, loss, $1,173,045.

Aluminum Company of America, Pittsburgh, Pa.: 1932, loss $2,172,731; 1931, profit, $3,910,054.

Joseph Dixon Crucible Co., Jersey City, N. J.: 1932, loss, $566,624.

U. S. Foil Co., Louisville, Ky.: 1932, profit, $495,818; 1931, profit, $739,899.

Aluminium, Ltd., Toronto, Ont.: 1932, loss, $930,134.

Quarterly Reports

Bohn Aluminum and Brass Corp., Detroit, Mich.: quarter ended March 31, 1933, net profit, $100,602; same 1932 quarter, net loss, $73,201.

Rapid Electrotype Company, Cincinnati, Ohio: quarter ended March 31, net profit, $13,046.

Union Carbide and Carbon Corporation, New York: quarter ended March 31, net income, $1,658,464, against $1,981,439 in same 1932 quarter.

Yale & Towne Manufacturing Company, Conn.: quarter ended March 31, net loss, $107,093, against $158,937 loss in same 1932 quarter.

New Corporations

Gar-Worth Manufacturing Co., Inc., 611 West Wisconsin Avenue, Kaukauna, Wis.; $10,000 capital; to manufacture metal specialties; by G. R. Charlesworth and associates. Company is in market for steel tubing, size 3½ in. and 3⅞ in. I.D., 281 WL., grade 1020 S.A.E.

John D. Ward Brass and Iron Foundry, Inc., Elmira, N. Y.; by **John D. Ward** and associates; operates complete nonferrous foundry and machine shop.

Business Items—Verified

Solar Manufacturing Corporation, 599 Broadway, New York, manufacturer of electrical products, has leased additional space for operations, making a total of 25,000 sq. ft. now used.

Brooklyn Metal Stamping Corporation has leased a floor at 25 Lafayette Street, Brooklyn, N. Y., for a new plant. Company does stamping, spinning, tinning, soldering, plating, polishing, grinding, lacquering, japanning.

Richards Company, Inc., has moved all offices to its plant at Malden, Mass. Company is one of America's oldest metal houses, established 1812. Its business is smelting and refining primary and secondary nonferrous metals.

Concord Silversmiths, Inc., Concord, N. H., has resumed operations, having received a number of orders, including some Pacific Coast business. Company operates casting, spinning, stamping, soldering, plating, polishing and grinding departments.

Scovill Manufacturing Company, Waterbury, Conn., has been licensed by the Dardelet Threadlock Corporation, 120 Broadway, New York City, to manufacture and sell "Rivet-Bolts" and other bolts and nuts with the Dardelet self-locking thread.

Mac Farland Manufacturing Company, Inc., well known maker of buffing and polishing wheels, has removed its executive office from 110 East 42nd Street, New York, to 21-03 41st Avenue, Long Island City, New York. The new telephone number is STillwell 4-1882.

National Lead Company, New York, has acquired control of the lead alloy department of Master Builders Company, Cleveland, Ohio, through majority ownership of stock in a new company, **Master Metals, Inc.**, formed to take over the department. The old owners retain an interest. The business is smelting and refining.

Milwaukee Metal Spinning Company, 227 East Lincoln Avenue, Milwaukee, Wis., is altering plant and adding equipment to increase capacity by 50%. Will recall entire force upon completion. Company operates spinning, stamping, soldering, brazing, polishing, grinding and lacquering departments. **T. J. Salow, Jr.,** is active head.

Coppus Engineering Corporation, Worcester, Mass., has appointed **Cooper Pogue,** Chamber of Commerce Building, Cincinnati, Ohio, sales representative in Cincinnati district for its line of Coppus-Annis dry type air filters for ventilating and industrial purposes. It is stated that Mr. Pogue has already closed several sizable contracts.

William Highton and Sons, formerly operating a nonferrous and ferrous foundry at Nashua, N. H., has removed to New Britain, Conn., where it will continue to operate as part of **Hart, Cooley and Highton.** Company operates complete nonferrous foundry and machine shop, stamping, brazing, plating, polishing, grinding, lacquering and japanning departments.

Pangborn Corporation, Hagerstown, Md., manufacturer of blast cleaning and dust collecting equipment, has completed a program of plant expansion consisting over $100,000, according to **Thomas W. Pangborn,** president, who says: "We will continue to pioneer in the advancement of the equipment we manufacture, as well as in improvement of our facilities and methods."

Penn Oil Burner Company, Clinton, Mass., organized in 1932 by Arthur Altman and associates, has leased part of the Rodger mill at Clinton for manufacturing purposes, and an office building near the mill for headquarters. Company reports increased business made it necessary to expand production facilities. Sales have been in New England but company will establish a sales office in New York State in near future, it is stated.

News From Metal Industry Correspondents

New England States

Waterbury, Connecticut

MAY 1, 1933.

Brass manufacturers are divided as to whether legalization of beer has helped business. There has been a slight improvement, they admit, but there is doubt that it is due to beer.

President Coe of American Brass, reports a slight improvement, but no noticeable increase in orders for equipment for bars and breweries. **Rodney Chase** of Chase Companies, said much the same. **John H. Goss** of Scovill, reported little increase in orders due to beer legalization.

Waterbury Clock Company, was closed for two weeks before and after Good Friday, to take inventory. Two or three departments operated. W. R. B.

Connecticut Notes

MAY 1, 1933.

NEW BRITAIN—Landers, Frary & Clark report business is slightly better. An advance in prices of all articles is being considered.

Stanley Works and **North & Judd Mfg. Co.** also state price changes are being considered.

HARTFORD—George W. Campbell, general manager of the **Underwood Elliott Fisher plant,** says business last month was the best of any month since July.

Royal Typewriter Company, which has been operating two days a week, is now working three days.

Officers and directors of the **Colt's** company were reelected last month.

Whitney Mfg. Company, received fair sized orders for automobile parts last month. **Hanson-Whitney** has some good orders for machinery, but **Pratt & Whitney** report no improvement.

BRISTOL—New Departure has recalled many employes, and has increased working hours to 40 a week, compared to 21 hours in March. The company has purchased the Birge property, a tract of land and two factory buildings, closed for over a year.

Bristol Brass has given a tract of land to the Celtic Athletic Club for a club house.

Wallace Barnes Company is organizing a subsidiary, **Dunbar-Gibson Company,** to manufacture metal specialties.

WINSTED—A committee of citizens was formed to assist in reorganization of **William L. Gilbert Clock Company,** now in receivership, when it was learned a substantial block of stock had been offered to a competitor, which might mean the concern would leave the city. Some creditors were asked to discount their claims in return for immediate settlement. The latter have been informed they will be paid in full if the company is allowed to continue operations. It has received considerable business lately. The 350 employes have accepted substantial cuts in pay and are keeping the concern running. The sales force has been reorganized.

Only one bid was made for the **Polymet Mfg. Company** plant at the auction held last month, **Wheeler Insulated Wire Company,** of Bridgeport, bid $2,500. It was not accepted as taxes alone are twice that amount. The auctioneer disposed of the machinery, stock and equipment in many small lots, the prices received being less than 5 per cent of the cost price. The factory was built recently and has floor space of 20,000 feet, is of brick and steel, equipped with sprinklers and adjoins the railroad. It was originally owned by the **Strand & Sweet,** which sold it to Polymet in 1929. That year its earnings were $70,000. Irving Trust Company is receiver. Polymet has another plant at Easton, Pa., which is to be auctioned off.

MERIDEN—International Silver Company has reelected all officers and directors. Company states price changes are to be made shortly. It is receiving orders from hotels for silver beer steins.

New Departure has recalled 300 employes to its local plant, and increased working hours from 35 and 40 to 45 and 50 weekly.

BRIDGEPORT—Bridgeport Brass reports increased volume of business. Brass prices have been advanced.

TORRINGTON—Patrick J. Fitzgerald has patented a food mixing, juice extracting and grinding machine which will be made by **Fitzgerald Mfg. Company.**

GLASTONBURY—Williams Bros. Mfg. Company, silverware maker, is operating overtime with a force about 60 per cent of normal. **President Pinney** says indications point to increased business.

SOUTHINGTON—Peck, Stow & Wilcox Company announces the resignation of **George S. Caseux** as president, and election of **Mark J. Lacey** of New Britain as his successor, and general manager. **O. J. Black,** vice-president and factory manager, and **Arthur G. Potter,** secretary and controller, have retired. **Ralph Hurlburt** is now secretary; **Samuel C. Wilcox,** assistant secretary and assistant treasurer; **Edward Hackbarth,** assistant to president. **A. J. Trapp** was appointed superintendent.

WALLINGFORD—H. L. Judd Company reports a rush of demand for brass bar railings. W. R. B.

Providence, Rhode Island

MAY 1, 1933.

The past month witnessed a slight upward swing in the metal trades. Rhode Island plants covered by the Commissioner of Labor, employed at the end of March 46,707, compared with 50,646 at the end of February. Included were 25 jewelry plants with 3,074 employes in March as compared with 3,903 in March, 1932, and 4,416 in March, 1931. In the metal trades, 30 firms reported 4,794 employed in March, 1933; 5,456 in March, 1932; and 7,826 in March, 1931.

Metal Cast Novelties Manufacturing Company is a new concern here. It manufactures metal images, tokens, medals and plaques. The company, and the industry in Providence as well, is in its infancy, but the proprietors hope to enlarge their field. The company was established by **Ludger Lapointe,** for seven years chief inspector in the hard rubber department of the United States Rubber Company at its Valley Street plant, Providence; and **Omer St. Laurent,** who had worked for a number of years with the **Edward N. Cook Plate Company,** manufacturers of gold plate and wire.

Frederick J. Stubbs, of Gaspee Plateau, Warwick, and associates are incorporators of **F. J. Stubbs, Inc.,** a manufacturing jewelry business here.

Paul I. Jorjorian, 37 Rhodes Avenue, Edgewood, R. I., has filed as the owner of **Interstate Plating Company,** 227 Eddy Street, Providence.

State Welding Company, Inc., Providence, has been incorporated.

Abraham Bazar, doing business as **A. Bazar and Company,** manufacturing jewelers, 25 Calendar Street, has filed a voluntary petition in bankruptcy.

The final account of the trustee in bankruptcy for **La Salle Ring Company, Inc.,** Providence, has been allowed by the Superior Court and the estate closed.

Rabinowitz Manufacturing Company, manufacturing jewelers, 253 Georgia Avenue, has been petitioned into receivership by **Settimio Orsini,** vice-president, secretary, stockholder and creditor of the corporation. **Samuel H. Workman,** attorney, has been appointed receiver.

B. & O. Chain Company, Inc., manufacturing jewelers, 158 Pine Street, on April 4 made a general assignment for the benefit of its creditors to **Max Winograd, attorney.**

Langelier Manufacturing Company, Cranston, R. I., has filed notice of re-

duction in capital stock from $100,000 to $1,000.

Edward P. Martin, 57, for several years foreman in the tool department of the **Brown and Sharpe Manufacturing Company,** died April 16 at his home at Fruit Hill, Providence. He was born in Hartford, and came to Providence some 20 years ago.

The Jewelers' Supply Company, Inc., has been incorporated here to manufacture jewelers' findings, by Frank E. Farnham and associates. W. H. M.

Western Massachusetts

MAY 1, 1933.

A decided increase in activity among Western Massachusetts metal working concerns looms at the opening of the month, with several factories increasing working hours because of greatly increased orders. Business leaders sound a new note of optimism as orders continue on the upgrade, and sentiment leans toward continued faith in the recovery of industry in this section.

Westinghouse Electric and Manufacturing Company has jumped from a three to a five day week on an order for 50,000 small motors for food mixers. The units are of the AC-DC type and their production will keep the small motors department on the new schedule for some time.

Manufacture of gears by **Perkins Machine and Gear Company** is showing considerable improvement, and some overtime work is being done in addition to the regular schedule of five days per week. Orders from some of the large washing machine companies are said to be a prominent factor in the increase, with other forms of domestic appliances also playing a part in the recovery. Production of automatic stokers is said to be one of the more active channels for gear sales at the present time. At this plant machine tool outlets continue to be comparatively inactive for the gear makers, and the same report is given respecting the talking movies field.

Owing to improvement in orders for various models, **Indian Motocycle Company** has advanced its working schedule from three to five days.

Business at the **United American Bosch** plant is showing slight improvement, according to officials here, with new radio units being stressed.

Slight improvement is noted at the **Wico Electric Company** in West Springfield.

Business at **Baush Machine Tool Company** and the **Van Norman Machine Tool Company** is slightly better, but officials refused to express any great optimism over the small orders sifting in for the automotive divisions.

Cheney-Bigelow Wire Works' business remains about the same. This is also true at **Westfield Manufacturing Company** and **Westfield Specialties Company,** although at the latter firm increased activity in the near future is predicted by plant officials.

Indian Motocycle Company April 24 met to vote on a plan for reorganization and reduction of capitalization.

G. B. Y.

Middle Atlantic States

New Jersey

MAY 1, 1933.

General Cable Company has leased a portion of its plant at Harrison, N. J., formerly occupied by the **A. A. Wire Company,** to the Checker Cab Sales Corporation of New York.

Valley Chemical Works, Carlstadt, will repair its chemical works plant which was recently damaged by fire.

Standard Lamp Company of New Jersey, Newark, has been chartered with 100 shares, to manufacture lamps. **Continental Tool and Die Works, Inc.,** Newark, has been incorporated with 200 shares to manufacture tools.

Siegfried Roebling, vice president of the **John A. Roebling's Sons Company,** Trenton, has recovered from a severe injury to his leg and is now able to attend to business again. He received his injury in a fall.

The big plant of the **Trenton Brass and Machine Company,** Trenton, was gutted by a three-alarm fire the latter part of March, resulting in a serious loss. Two floors of the main three-story building were wiped out, and goods on the first floor were ruined by water. Another large L-shaped building, which was formerly the original plant, was burned to the ground. Other nearby plants were threatened by the flames. **William Schulte,** vice-president of the company, immediately placed the employes at work clearing up the debris, to prepare for rebuilding. In that way no one lost any time. The fire was one of the most spectacular in Trenton in many years.

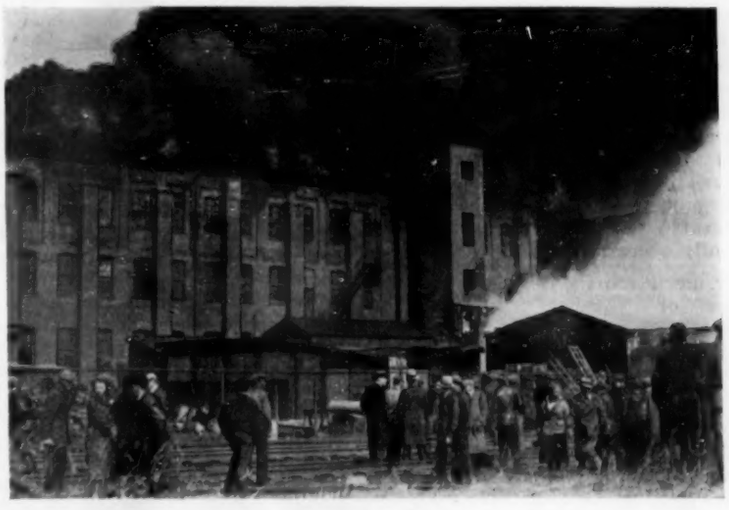
C. A. L.

Central New York

MAY 1, 1933.

Employment in the metal trades in Utica dropped off 12 per cent during March. Foundry employment was reported to be up about two per cent. The general employment picture in Utica, according to officials of plants, is not very brilliant at present.

Remington Arms Company, Inc., Ilion, released an annual report which shows a net loss of $794,241.90 for 1932. Despite the loss, **President Sanders Norvell** said, the company made substantial progress during the year in retiring its funded debt by purchases in the open market at less than par.



Fire at Plant of Trenton Brass and Machine Company. (See below)

Bossert Corporation, Utica, is manufacturing quite a number of articles which require chromium and nickel plating.

William S. Murray, chemist for the **Oneida Community, Ltd.,** has been elected president of the Utica Rotary Club.

A more optimistic report comes from Rome, N. Y., this month where it was reported that the **Revere Brass and Copper Company** plant was running with three shifts of men, seven days a week, in some of the departments. Sale of kitchen utensils in the newer designs has greatly increased, it was stated.

Another Rome plant was also reported to have several substantial orders.

E. K. B.

Middle Western States

Detroit, Michigan

MAY 1, 1933.

With the gradual clearing of the banking situation here, manufacturers in the nonferrous metal industries are beginning to take heart. The past three months were as quiet as any since the start of the depression. Production of motor cars fell far below former records for this season of the year. Now most of the plants are starting up, and producing to meet current demand which, of course, is none too brisk.

Accessory plants are gradually resuming work also, and the same may be said for the plating plants which have been inactive for a long time.

Production of refrigeration units seems to be getting back into spring activity. Most of the plants in this area are making favorable reports from time to time. This is one industry that has not felt the full force of the financial upheaval.

So far as can be determined the brewing industry does not seem to be bringing any great amount of new business into this area, either for refrigeration units or motor cars. Those commenting on it seem to feel that its importance to the rest of business world is greatly overestimated.

Not much activity is noted in manufacture of plumbers' supplies, or jewelry.

Kelvinator Corporation has resumed full factory production 5½ days a week. Orders since the banking holiday indicate a ten per cent increase over the same period for 1932.

J. M. Hutton, Jr., of W. E. Hutton and Company, was elected a director of the **Bohn Aluminum and Brass Corporation**, at the recent annual meeting. Other directors and officers were re-elected. **Charles E. Bohn**, president, told stockholders the company was making progress with its new aluminum cylinder head.

A definite upward trend in replacement business for automobile equipment is seen by **W. S. Isherwood**, of **AC Sparkplug Company**, Flint, Mich.

Detroit Wire Die Company, Inc., 17360 Lasher Avenue, was recently incorporated to manufacture wire dies, by **William L. Brown** and associates.

Increasing use of wood stoves as a result of unemployment and unfavorable farm prices, has brought such an upturn in demand that **Kalamazoo Stove Company** will operate six days a week, according to **Arthur L. Blakeslee**, president. The factory in 1932 reported a 7% increase in the demand for wood stoves. This year the demand is up 14%. F. J. H.

Toledo, Ohio

MAY 1, 1933.

Manufacturers of motor car accessories reported a moderate increase in business last month. Outside of this, however, manufacturing is lagging in general, and not meeting expectations, due largely to the financial disturbance. At this season, plants should be operating at capacity, but many are doing hardly anything.

The motor car industry is indicating some revival, but production thus far is making slow headway.

Plating, owing to the diversified manufacturing here, is perhaps in somewhat better condition than in some of the other industrial centers on the Great Lakes. But even this is not what it should be.

It is extremely difficult to make any kind of a forecast for the summer.

F. J. H.

Chicago, Illinois

MAY 1, 1933.

In the center of the brewing territory, Chicago business felt a slight psychological uplift from the moment of legalization. This was accentuated by Easter holiday trade, particularly in the retail field. Brewery activity has stimulated the metal industries somewhat. Raw materials such as tin, brass and copper have been purchased in greater quantities for plants. Vacant stores are being converted into restaurants and beer gardens, which means further utilization of nonferrous metals in equipment. Refrigerator and automotive sales are expected to increase.

Studebaker and **Rockne** sales for the period ending March 31, exceeded all previous similar periods since June, 1932. Factory production has been stepped up and between 4,500 and 5,000 men are expected to be at work within the next few days.

Employment at the **Grigsby-Grunow Company** now exceeds that of a year ago. Production of both refrigerators and radios is ahead of production of a year ago, and collections from distributors which have increased 50 percent since the end of the moratorium, are better than at any time during the past year. Current production of the new Grunow carrene type refrigerator has reached 500 per day.

Hart and Cooley Manufacturing Company has announced a new cold air face which will be furnished in black, japan, oak, oxidized copper, and nickel and brass.

Neil C. Hurley has been elected president of the **Independent Pneumatic Tool Company. Ralph S. Cooper**, retiring president, was elected vice-president in charge of eastern territory, with headquarters in New York. **Frank S. Hamerly** was elected vice-president in charge of the Aurora plant.

Joseph M. Chaney, for ten years vice-president in charge of sales of Ditto, Inc., has joined the **Hurley Machine Company** as head of the air conditioning department.

David S. Gaston, formerly in charge of branch warehouses, has been appointed sales manager for tin mill products of the **Follansbee Brothers Company**, succeeding **J. C. Kilroy**, now sales manager of the jobbing department.

New incorporations include: **Mound City Brewing Company**, New Athens, capitalized at $50,000; **Copper Products Corporation of America**, 32 West Randolph Street; **National Metal Products Corporation**, 4501 West Fillmore Avenue; **Faulds Oven and Equipment Company**, 4526 Diversey Avenue; **L. S. Cohen and Company**; to manufacture metals of all kinds. R. G. K.

Pacific States

LOS ANGELES, MAY 1, 1933.

The new **Chrysler** plant at 800 Eastern Avenue, Los Angeles, is in operation. **P. W. Gaebelein** is plant manager.

Despatch Oven Company of Minneapolis, has appointed **E. C. Buehler**, 669 Howard Street, San Francisco, district engineer and sales manager for northern Pacific Coast. Company makes japanning, enameling, core, coil and armature ovens and driers, and baking ovens.

Casa Shannon Corporation, Long Beach Avenue, Los Angeles, will manufacture truck brakes. **C. V. Kendrick** is president.

Wenzel and Henoch Construction Company, Milwaukee, will erect complete machine shop at Beaumont, near a tunnel site. **E. F. Henoch** is in charge.

U. S. Spring and Bumper Company, Vernon, has spent $50,000 to enlarge its plant. A line of farm tools has been added to output.

General Water Heater Corporation, Burbank, is building a $3,000 plant addition, and will move its machine shop from Los Angeles to Burbank. Company has large brass and galvanizing shops.

Saul A. Joseph, formerly sales manager for American Pipe and Steel Corporation, is now purchasing agent for the **Metropolitan Water District of Southern California**, with offices at 306 West 3rd Street, Los Angeles.

Magnuson Products Corporation, Brooklyn, N. Y., has opened a branch office at 1340 East 6th Street, Los Angeles, in charge of **R. E. Craig**.

Considerable metal business has developed out of building operations made necessary by the earthquake damage at Long Beach, San Pedro, Compton, Santa Ana, etc.

Dobson Brothers, 1247 Market Street, San Diego, have installed electric welding equipment.

C. F. Chambers has formed Industrial Art Metallizing Company at 1000 Macy Street, Los Angeles.

Puget Sound Power and Light Com-

pany, Puyallup, Wash., has installed complete machine and welding shop at Stewart Street and 2nd Avenue, that city.

General Sheet Metal Works, 2010 Westlake Avenue, Seattle, Wash., has been organized by **E. B. Blair** and **L. E. Smith.**

W. A. Davidson, 1716 West First Street, Aberdeen, Wash., will establish a metal toy factory.

John C. Dewey, Huntington Park, Calif., has opened a welding shop at 237 South Figueroa Street, Los Angeles.

Industrial Inventions Manufacturing Company, 6355 Compton Avenue, Los Angeles, will specialize in metal work for inventors.

Universal Microphone Company, Inglewood, Calif., has perfected a line of battery converters.

Henry T. Burkey, La Crescenta, Calif., is manufacturing chains to be charged with electricity to keep fish away from creeks, rivers, dams, irrigation canals, etc., where they would be in danger.

Pacific Coast canneries are planning to make use of considerable nickel, monel metal and Inco chrome nickel for improvements in processing equipment, it is reported.

Governors of western states which produce copper have joined in an effort to promote the use of the metal, which is piling up in considerable surplus, causing unemployment.

Water conveyance equipment to Los Angeles and other southern California points from the Hoover Dam project will probably require $100,000,000. Immense quantities of copper, brass, aluminum, nickel and other metals will be used.

Harold V. Engh, vice-president of Anaconda Wire and Cable Company, was recently in California to inspect the new wire drawing unit that has been added to the plant at Orange, Calif.

National Steel Homes, Inc., Los Angeles, recently exhibited an all metal house designed by **Architect H. S. Broadley.** It is air conditioned and offers a new solution to the modern housing problem.

T. B. Finks, 2925 West San Fernando Boulevard, Burbank, Calif., will establish a plant to manufacture water heater shells, concentrating on replacement work.

Renton Company has built a new chemical plant at 300 Lake Avenue, Pasadena.

Murray Steel Products, Cleveland, Ohio, has acquired Woodlite Company, Hollydale, Calif., manufacturer of auto, flood and airport lights. **C. C. Roummage** is general manager. Plant will be remodeled and will add auto fenders and parts to output.

Western Enterprise Engine Company, Los Angeles, gas engine builders, are rapidly progressing in manufacture of Diesel engines fueled by low priced oil, and expects a large increase in business.

Stovurn Company, 2408 East 57th Street, Los Angeles, is making a new line of coffee urns.

Richter Brothers, 209 Garey Street, Los Angeles, is making large and small coffee urns, silex, coffee heaters, etc.

Liquid Gas Orchard Heater Company, 163 Commercial Street, Pomona, Calif., is getting into production to make a new type of orange grove heater. **P. R. Melchert** is manager.

Acme Steel Company, 300 Avery Street, Los Angeles, is making galvanized hoop metal for use on fruit and vegetable boxes.

Lyon Electric Company, San Diego, is making burglar and fire alarms.

Riverside Sheet Metal Company, Riverside, Calif., is making heavy heaters for citrus fruit groves.

McCorkle-Nugent, 354 Hobart Street, Oakland, Calif., is making a new temperature control device for gas-fired heaters and similar application.

Merco Nordstrom Valve Company, Oakland, reports a considerable output of gas pressure regulators for heaters, boilers, furnaces, etc.

W. & W. Sheet Metal Works, Los Angeles, has installed a large press brake made by **Farrel-Birmingham Company,** Ansonia, Conn.

E-Z Lawn Edger Company, 823 West Vernon Avenue, Los Angeles, is making all kinds of garden tools. H. S.

Metal Market Review

MAY 1, 1933.

Practical assurance that inflation would be undertaken by the Administration was reflected in all nonferrous metals last month, and as April drew to a close a definite upward sweep occurred, carrying prices to the best levels in some time. Daily prices and monthly averages are given in the table on the next page.

Copper

The copper price went steadily upward throughout April, reaching 6.75c. on the last day, following passage of the inflation bill by the Senate. Demand for metal during the month was better, some good transactions taking place for the account of consumers as well as speculative interests. There still is needed, however, a general resumption of business to make a real impression on surplus stocks of the metal, according to L. S. Cates, president of Phelps Dodge Corporation, who last month stated his company was producing 4 million pounds a month, against almost 6½ million pounds a month last year. Among constructive developments now in sight which might aid copper he mentioned the International Economic Conference.

Lead

Lead closed the month at 3.37½c., about a half cent above the quotation at the beginning of April. At the higher figure the last week of the month, business was reported in good volume, with consumers as well as speculators interested. March statistics showed increased surplus stocks of lead at the end of that month, but a curtailment program has been in effect during April, and this is expected to result in lower stocks henceforth. Producers are reported to have fairly well filled order books at average prices.

Zinc

At the end of April, zinc was quoted at 3.65c. to 3.70c. East St. Louis basis, which was about 0.65c. above the price on April 1. While stocks showed a gain at the end of March, producers are confident that future statistics will show decreases, due to production curtailment. Prices were held fairly firm through the month, and in the final week sales were in sufficient volume to send the price up.

Tin

Tin prices went up about 5½c. during April, Straits, N. Y., reaching 30.12½c., on the 28th, as against 24.60c. at the beginning of the month. There was active buying throughout the month by both users and speculators. Increased activity of tin plate producers is taking more metal into consumption. There is no assurance as to how long this will continue, but observers generally look for a strong tin market for some time to come.

Other Metals

Aluminum—The price of mill and commercial 99 per cent plus ingots remained unchanged at 23.30c. per pound. Business is on a restricted basis, in line with all other commodities, but of such business in metals as there is, aluminum is getting its share, according to reports.

Antimony—The price of antimony was stronger, closing the month at 6.25c., as against 5.825c. at the beginning of April. The metal, of course, is sharing the price strength occasioned by the imminence of monetary inflation.

Precious Metals—Silver was promptly affected by the inflation moves, and during April it went to new highs for recent months, showing a gain of as much as 10c. an ounce at one time. It started the month at 27c. On April 24 it was up to 37.25c. It declined again, and ended the month at 34.625c. There was some good purchasing done, largely of a speculative nature.

Platinum reached a new high level for recent months when it touched $29 an ounce at the end of April. The metal had been strong throughout the month.

Scrap Metals—In accord with the new markets for virgin metals, practically all divisions of the scrap and secondary metal market were quoting higher prices. The complete list of prices will be found on page 189.

Brass Ingot Statistics

On April 1, unfilled orders for brass and bronze ingots and billets on the books of the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., amounted to a total of 15,591 net tons, as compared with 14,952 tons on March 1.

Average prices per pound received by the Institute members on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending April 21, 1933, are as follows, with comparative prices reported for the period ended March 24:

	28 Days Ended	
Commercial 80-10-10	April 21	March 24
(1% Impurities) ...	6.258c	6.397c
Commercial 78%	4.578c	4.904c
Commercial 81%	4.948c	4.835c
Commercial 83%	5.281c	5.355c
Commercial 85-5-5-5 ..	5.722c	5.689c
Com. No. 1 yellow ...	4.393c	4.513c

Metal Developments

GOLD weighing 860 pounds, contained in an ancient bell discovered at Arica, Chile, will pay off the entire municipal debt of that city, according to a press report last month.

ALUMINUM and its alloys are being used almost exclusively in construction of high powered rockets at Magdeburg, Germany, according to Franz Mengering, engineer in charge of the Raketenflugplatz (rocket flying field) at that city. The rocket experimentations is being subsidized by the municipality.

The Wrought Metal Market

MAY 1, 1933.

Prices of some copper and brass mill products, including some of the finished and semi-finished forms of copper, brass, bronze and nickel silver, were advanced by the leading producers on April 21, causing a revision in the list which had been in effect since March 14. The complete revised list will be found on the opposite page. The advances were one-half cent a pound. All allowances for scrap were also advanced one-half cent by the producers. In the same date the prices of fabricated lead products advanced their quotations one-quarter cent a pound on sheets and one-half cent on pipe, while the discounts were lowered on lead traps and bends to 40% and on combination bends to 20% and 5%. The increases in metal products were, of course, in line with the advances in raw metals, due largely to the impending inflation action by the government, which in turn prompted a certain amount of demand other than requirements for immediate use.

So far there has been no widespread increase in business, although the general outlook is considerably better than several months ago. From widely separated parts of the country come reports that manufacturing operations are expanding, notably in the Great Lakes cities, where the automobile industry and allied lines provided most of the activity; and New England, where the metal fabricators are reported to be getting business arising from the brewing revival, as well as from the automotive lines.

At a meeting of Patino Mines and Enterprises Consolidated, large tin producers, E. J. Cornish, vice-president, stated that sales of block tin pipe have expanded remarkably since large scale brewing activity was resumed. It is said that practically all plants in the country producing this material are working overtime to supply the demand.

Aluminum has also gained business from the brewing industry. A Pittsburgh report stated that the Aluminum Company of America had taken an order for six tanks each of 97,200 gallons capacity for one brewery. The tanks are to be fabricated at New Kensington, Pa., it was stated.

From Connecticut there were reports of better orders from hotels for silverware, including silver steins; and for brass railings and fittings.

The American Bureau of Metal Statistics reports tentative figures for use of nonferrous wire in the asbestos textile industry as follows, in pounds:

Wire	1930	1931	1932
Copper ...	100,000	103,000	56,000
Zinc	530,000	447,000	386,000
Brass	6,150,000	4,700,000	2,700,000

Daily Metal Prices for April, 1933

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	3	4	5	6	7	10	11	12	13	*14	17	18
Copper c/lb. Duty 4c/lb.												
Lake (Del., Conn.)	5.00	5.00	5.00	5.375	5.375	5.625	5.625	5.50	5.50	. . .	5.50	5.50
Electrolytic (Conn.)	5.00	5.00	5.00	5.25	5.25	5.50	5.50	5.375	5.375	....	5.375	5.25
Casting (f.o.b. ref.)	4.75	4.75	4.75	5.00	5.00	5.25	5.25	5.125	5.125	....	5.125	5.125
Zinc (f.o.b. East St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.00	3.00	3.00	3.00	3.00	3.10	3.10	3.10	3.10	....	3.15	3.175
Brass Special	3.05	3.05	3.05	3.05	3.05	3.15	3.15	3.15	3.15	....	3.20	3.225
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	24.70	25.00	25.00	25.10	25.25	25.50	25.50	25.50	25.65	....	25.70	26.30
Pig 99%	23.15	23.30	23.40	23.60	23.70	23.85	24.00	24.00	24.20	....	24.25	24.90
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	2.875	2.875	2.875	2.875	2.875	2.875	3.125	3.125	3.125	....	3.125	3.125
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	. . .	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	....	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	....	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	....	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	5.90	5.90	5.60	5.60	5.60	5.60	5.60	5.60	5.60	....	5.60	5.60
Silver c/oz. Troy Duty Free	27.00	27.00	27.125	27.50	27.25	27.625	28.00	27.625	28.25	....	28.625	28.875
Platinum $/oz. Troy Duty Free	24.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	....	25.00	25.00

	19	20	21	24	25	26	27	28	High	Low	Aver.
Copper c/lb. Duty 4c/lb.											
Lake (Del., Conn.)	5.625	6.50	6.375	6.375	6.625	6.625	6.625	6.625	6.625	5.00	5.809
Electrolytic (Conn.)	5.50	6.50	6.25	6.25	6.375	6.50	6.50	6.50	6.50	5.00	5.697
Casting (f.o.b. ref.)	5.25	6.25	6.00	6.00	6.25	6.25	6.25	6.25	6.25	4.75	5.461
Zinc (f.o.b. East St. L.) c/lb. Duty 1¼c/lb.											
Prime Western	3.35	3.75	3.70	3.70	3.70	3.70	3.65	3.70	3.75	3.00	3.315
Brass Special	3.40	3.80	3.75	3.75	3.75	3.75	3.70	3.75	3.80	3.05	3.364
Tin (f.o.b. N. Y.) c/lb. Duty Free											
Straits	28.00	29.50	29.375	29.875	30.25	29.875	29.625	30.125	30.25	24.70	27.149
Pig 99%	26.50	27.75	27.875	28.25	28.50	28.125	27.875	28.375	28.50	23.15	25.558
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.125	3.375	3.375	3.375	3.375	3.375	3.375	3.375	3.375	2.875	3.138
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.											
Electrolytic 99.9%	35	35	35	35	35	35	35	35	35	35	35
Shot (from remelted electrolytic)	36	36	36	36	36	36	36	36	36	36	36
Pellets 99.5-100%	40	40	40	40	40	40	40	40	40	40	40
Antimony (Ch. 99%) c/lb. Duty 2c/lb.	5.95	6.125	6.125	6.125	6.125	6.25	6.25	6.25	6.25	5.60	5.863
Silver c/oz. Troy Duty Free	32.375	35.50	34.25	37.25	36.00	35.25	35.375	34.625	37.25	27.00	30.816
Platinum $/oz. Troy Duty Free	25.00	†	28.00	28.00	29.00	29.00	29.00	29.00	29.00	24.00	24.789

*Holiday. †No offer.

Metal Prices, May 1, 1933

(Import duties and taxes under U. S. Tariff Act of 1930, and Revenue Act of 1932)

NEW METALS

Copper: Lake, 6.75. Electrolytic, 6.75. Casting, 6.375.
Zinc: Prime Western, 3.75. Brass Special, 3.80.
Tin: Straits, 32.375. Pig, 99%, 30.375.
Lead: 3.375. Aluminum, 23.30. Antimony, 6.25.
Nickel: Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
Quicksilver: Flask, 75 lbs., $56. **Bismuth,** 85.
Cadmium, 55. **Silver,** Troy oz., official price, N. Y., May 2, 35.50.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $22 to $24.

Duties: Copper, 4c. lb.; zinc, 1¼c. lb.; tin, free; lead, 2¼c. lb.; aluminum, 4c. lb.; antimony, 2c. lb.; nickel, 3c. lb.; quicksilver, 25c. lb.; bismuth, 7½%; cadmium, 15c. lb.; cobalt, free; silver, free; gold, free; platinum, free.

INGOT METALS AND ALLOYS

	Cents lb.	Duty	U. S. Import Tax*
Brass Ingots, Yellow	5 to 6¾	None	4c. lb.[1]
Brass Ingots, Red	6¼ to 9½	do	do
Bronze Ingots	6 to 12½	do	do
Aluminum Casting Alloys	8¾ to 11¾	4c. lb.	None
Manganeze Bronze Castings	17 to 32	45% a. v.	3c. lb.[2]
Manganese Bronze Forgings	23 to 35	do	do
Manganese Bronze Ingots	7¾ to 10½	do	4c. lb.[1]
Manganese Copper, 30%	15 to 22½	25% a. v.	3c. lb.[2]
Monel Metal Shot or Block	28	do	None
Phosphor Bronze Ingots	7¾ to 10	None	4c. lb.[1]
Phosphor Copper, guaranteed 15%	10½ to 15	3c. lb.[2]	do
Phosphor Copper, guaranteed 10%	9¾ to 14	do	do
Phosphor Tin, no guarantee	35 to 45	None	None
Silicon Copper, 10%	18 to 30	45% a. v.	4c. lb.[1]
Iridum Platinum, 5%	$30	None	None
Iridum Platinum, 10%	$31	None	None

*Duty is under U. S. Tariff Act of 1930; tax under Section 60 (7) of Revenue Act of 1932.
[1]On copper content. [2]On total weight. "a. v." means ad valorem.

OLD METALS

Dealers' buying prices, wholesale quantities:	Cents lb.	Duty	U. S. Import Tax
Heavy copper and wire, mixed	4½ to 4⅝	Free	4c. per pound on copper content.
Light copper	3¾ to 4	Free	
Heavy yellow brass	2⅜ to 2⅝	Free	
Light brass	1¾ to 2	Free	
No. 1 composition	3⅜ to 3⅝	Free	
Composition turnings	3 to 3¼	Free	
Heavy soft lead	2⅜ to 2⅝	2½c. lb.	None.
Old zinc	1⅜ to 1⅝	1½c. lb.	
New zinc clips	2 to 2¼	1½c. lb.	
Aluminum clips (new, soft)	11 to 11½	4c. lb.	
Scrap aluminum, cast, mixed	4¼ to 4½	4c. lb.	
Aluminum borings—turnings	3 to 3¼	4c. lb.	
No. 1 pewter	17½ to 18½	Free	
Electrotype or stereotype	2⅛ to 2⅜	2½c. lb.*	
Nickel anodes	23½ to 25½	10%	
Nickel clips and turnings	18½ to 27½	10%	
Monel scrap	7½ to 11	10% a. v.	

*On lead content.

Wrought Metals and Alloys

The following are net BASE PRICES per pound, to which must be added extras for size, shape, small quantity, packing, etc., as shown in manufacturers' price lists, effective April 21, 1933.

COPPER MATERIAL

	Net base per lb.	Duty*
Sheet, hot rolled	13⅞c.	2½c. lb.
Bare wire, soft, less than carloads	9 to 9½c.	25% a. v.
Seamless tubing	12⅝c.	7c. lb.
Soldering coppers	15c.	45% a. v.

*Each of the above subject to import tax of 4c. lb. in addition to duty, under Revenue Act of 1932.

NICKEL SILVER

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	20¼c.	10% Quality	23¼c.
15% Quality	22½c.	15% Quality	27⅝c.
18% Quality	23¾c.	18% Quality	30⅞c.

BRASS AND BRONZE MATERIAL

Net base prices per pound, mill shipments.

	High Brass	Low Brass	Bronze	Duty	U. S. Import Tax
Sheet	11¾c.	12⅞c.	13¼c.	4c. lb.	4c. lb on copper content
Wire	11¾c.	12⅞c.	13¼c.	25%	
Rod	9¼c.	12⅝c.	13c.	4c. lb.	
Angles, channels	19¼c.		21¼c.	12c. lb.	
Seamless tubing	13½c.		15c.	8c. lb.	
Open seam tubing	19¾c.		21¼c.	20% a.	No tax.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.; import tax 4c. lb. on copper content.)	
Tobin Bronz Rod	13c.
Muntz or Yellow Restangular sheet and other sheathing	13⅞c.
Muntz or Yellow Metal Rod	10¼c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods (base)	35	Full Finished Sheets (base)	42
Cold Drawn Rods (base)	40	Cold Rolled Sheets (base)	50

SILVER SHEET

Rolled sterling silver (May 2) 38.00c. per Troy oz. upward according to quantity. (Duty, 65% ad valorem.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	9.00	2c. lb.
Zinc sheet, full casks (jobbers' price)	9.25	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00 to 10.25	2c. lb.
Full Lead Sheet (base price)	7.00	2¼c. lb.
Cut Lead Sheet (base price)	7.25	2¼c. lb.

BLOCK TIN, PEWTER AND BRITANNIA SHEET

(Duty free)

This list applies to either block tin or No. 1 Britannia Metal Sheet, No. 23 B. & S. Gauge, 18 inches wide or less; prices are all f. o. b. mill:

500 lbs. or over	15c. above N. Y. pig tin price
100 to 500 lbs.	17c. above N. Y. pig tin price
Up to 100 lbs.	25c. above N. Y. pig tin price

Lighter gauges command "extras" over the above prices.

Supply Prices, May 1, 1933

ANODES

Copper: Cast	14¼c.	per lb.
Rolled, sheets, trimmed	13¼c.	per lb.
Rolled, oval	12¾c.	per lb.
Brass: Cast	13¾c.	per lb.
Zinc: Cast	9c.	per lb.

Nickel: 90-92% 42c. to 46c. per lb.
95-97% 43c. to 47c. per lb.
99% cast, 45c. to 49c.; rolled, depolarized, 46c. to 50c.

Silver: Rolled silver anodes .999 fine were quoted May 2 from 38.00c., per Troy ounce upward, depending upon quantity.

WHITE SPANISH FELT POLISHING WHEELS

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$2.85/lb.	$2.55/lb.	$2.35/lb.
10-12-14 & 16	2 to 3½	2.75	2.45	2.25
6-8 & over 16	1 to 2	2.95	2.65	2.45
6-8 & over 16	2 to 3½	2.90	2.60	2.35
6 to 24	Under ½	4.15	3.85	3.65
6 to 24	½ to 1	3.85	3.55	3.35
6 to 24	Over 3½	3.25	2.95	2.75

Any Quantity

4 to 6	Under ½, $4.90	½-1, $4.75	1 to 3, $4.65
1½ to 4	" 5.45	" 5.30	" 5.25
1 to ½	" 5.75	" 5.60	" 5.50

Extras: 25c. per lb. on wheels, 1 to 6 in. diam., over 3 in. thick.
On grey Mexican wheels deduct 10c. per lb. from above prices.

COTTON BUFFS

Full disc open buffs, per 100 sections when purchased in lots of 100 or less:

11" 20 ply 64/68 Unbleached	$14.49 to 16.60
14" 20 ply 64/68 Unbleached	24.28 to 27.40
11" 20 ply 80/92 Unbleached	16.61 to 18.85
14" 20 ply 80/92 Unbleached	27.83 to 31.10
11" 20 ply 84/92 Unbleached	20.33 to 25.05
14" 20 ply 84/92 Unbleached	34.04 to 41.95

Sewed Pieced Buffs, per lb., bleached 30c. to 70c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.08-.09½
Acid—Boric (Boracic) granular, 99½+% ton lots	lb.	.04½-.05
Chromic, 75 to 400 lb. drums	lb.	.12-.17½
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08-.12
Nitric, 36 deg., carboys	lb.	.06-.06½
Nitric, 42 deg., carboys	lb.	.07-.08
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.095-.11
Denatured drums	gal.	.475-.476
Alum—Lump, barrels	lb.	.03¼-.04
Powdered, barrels	lb.	.03½-.05
Ammonia, aqua, com'l., 26 deg., drums, carboys	lb.	.02¾-.05
Ammonium—Sulphate, tech., bbls.	lb.	.03½-.05
Sulphocyanide, technical crystals	lb.	.28-.37
Arsenic, white, kegs	lb.	.04½-.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax, granular, 99½+%, ton lots	lb.	.02¼-.02¾
Cadmium oxide, 50 to 1,000 lbs.	lb.	.55
Calcium Carbonate (Precipitated Chalk)	lb.	.05¾-.07½
Carbon Bisulphide, drums	lb.	.05½-.12
Chrome Green, bbls.	lb.	.18
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.20
Carbonate, bbls.	lb.	.14-.20
Cyanide (100 lb. kgs.)	lb.	.39
Sulphate, bbls.	lb.	2.75-5.25
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.20¼-.20½
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluorspar, bags	lb.	.03½
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.32-.34
Iron Sulphate (Copperas), bbls.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead—Acetate (Sugar of Lead)	lb.	.09-.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Methanol, 100% synth., drums	gal.	.41½
Nickel—Carbonate, dry, bbls.	lb.	.32
Chloride, bbls.	lb.	.16-.21
Salts, single, 300 lb. bbls.	lb.	.11-.13
Salts, double, 425 lb. bbls.	lb.	.11-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.06¾-.08½
Potassium—Bichromate, casks (crystals)	lb.	.08
Carbonate, 96-98%	lb.	.06⅝
Cyanide, 165 lbs. cases, 94-96%	lb.	.50
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge—Nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.05-.05½
Silver—Chloride, dry, 100 oz. lots (Subject to fluctuations of silver market.)	oz.	.23-.27½
Cyanide (fluctuating)	oz.	.37½-.45
Nitrate 100 ounce lots	oz.	.20-.23¼
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.22
Beryllium fluoride ($2NaF.BeF_2$)	lb.	4.30-7.00
Hyposulphite, kegs, bbls.	lb.	.03½-.06½
Metasilicate, granular, bbls.	lb.	.03-.04
Nitrate, tech., bbls.	lb.	.03¼-.07
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.01½
Stannate, fluctuating	lb.	.25
Sulphocyanide	lb.	.30-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, fluctuating, 100 lb. kegs	lb.	.27½-.28
Tripoli, powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc—Carbonate, bbls.	lb.	.11
Chloride, drums, bbls.	lb.	.07½-.10
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½

WHITE FINISH

McAleer's new White Finish No. M-501 is an exceptional pre-chrome nickel buffing composition that produces very high lustre. It is a DRY mix, especially adapted to miscellaneous parts. Samples on request.

WHITE CHROME

White Chrome No. 13 is the newest and best White Chrome yet developed in the McAleer laboratories. Users will find it economical, as well as superior in good cut and high color. Samples furnished free.

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